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JULY, 1935.

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RENAL TUMOURS.

By HENRY WADE,
Edinburgh.

THE only cure for a tumour of the kidney is its removal by the surgeon's knife. There are various kinds of renal tumours and different means may be used to influence their rate of growth, but there is only one road to recovery, and that is the path I have indicated.

The surgeon must therefore be able to diagnose the presence of the growth at the very earliest opportunity; to recognize accurately, prior to operation, the type of tumour that is present, and thereby to determine the best line of treatment to adopt. He should know the complications that may occur with each type of tumour, and be prepared to deal with these when they appear. Finally, his knowledge of the morbid anatomy must be such that he can recognize the nature of the living tumour when it is exposed in the operating theatre.

THE ELIMINATION OF THE DIAGNOSTIC INCISION.

I shall have occasion later to refer at more length to the great value of pyelography as a means of telling when a tumour is present in the kidney. I would remind you that it is often only by a slight deformity in the contour of the pyelographic shadow that the truth is revealed. Perhaps, in view of the delicate and intimate examination necessary, there may be a surgeon who shares the opinion of a certain one now retired from active work who, when speaking of the diagnosis of intra-abdominal swellings, used to say with the intonation of the tired Titan, so characteristic of him: "Why worry and waste time? Look and see." To this recommendation the modern urologist answers an emphatic "no". It is his boast that at the conclusion of his examination he does not express an opinion; he states a fact. He proudly and justly claims to have eliminated the diagnostic incision from his practice. Sometimes his examination is not conclusive—an element of doubt remains. In such circumstances, experience has taught him that it is unwise to depend on confirmation to be obtained when the kidney is exposed in

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the operating theatre, for, although this examination usually puts the doubt at rest when the glistening golden brown surface of a small hypernephroma is seen embedded in the kidney tissue, a kidney containing concealed within it a tumour may, on the other hand, be normal in size, contour and consistence. If that be so, what are you to do? Never cut into a kidney for purposes of diagnosis. When doubt exists before operation, repeat the examination to confirm the previous findings. Put to yourself this question, and be prepared to answer it before you operate: "What action do I propose to adopt in the event of a kidney, normal in size, contour and consistence, being revealed, when I suspect the presence of a tumour within it?" "Are the grounds for my opinion such as to warrant my removing an organ that is apparently healthy?" If they are not, repeat the examination for further confirmation. I would emphasize this advice, for I would have you remember that the advance of surgery is rapid, and that as more early tumours are being met with, to tell of their presence is the more difficult and the appearances by which they are recognized the more subtle. Your responsibility is therefore all the greater, for the treatment, as I have said at the outset, is still the drastic remedy of nephrectomy. Therefore "mak siccar" before you lift the knife.

THE CARDINAL SIGNS OF RENAL TUMOURS.

The three cardinal signs of renal tumours are hæmaturia, a kidney that can be felt to be enlarged, and a characteristic alteration of the pyelographic contour.

Hæmaturia.—The appearance of blood in the urine is a sign that should never be ignored. Debenham studied the cause of hæmaturia in 742 consecutive cases from Mr. Lett's clinic in the London Hospital. He found that a neoplasm of bladder or kidney is the commonest cause of hæmaturia in men in the fifth decade of life, and in both sexes in the sixth decade. He found that carcinoma of the kidney was rare. It was the cause of the hæmaturia in only 2·5% of all cases, 3% being in men and less than 0·5% in women.

When hæmorrhage is due to tumour of the kidney, it is usually intermittent. The original attack is painless, but subsequent attacks are not infrequently accompanied by discomfort in the loin—a mild variety of renal colic—and the urine contains pencil-like clots, the voiding of which was the cause of the colic.

When a patient suffers from hæmaturia he should be submitted to cystoscopic examination forthwith, as it is particularly important to observe the actual source of the bleeding. In men over fifty it is probable that the cause of the bleeding will be seen within the bladder in a tumour growing from its wall, so much so that we lay down the rule, which is sound though not infallible, that if blood appears in the urine suddenly, painlessly and profusely in a patient previously in good health, it is due to a villous papilloma of the bladder. Confirmation of this is easily obtained by cystoscopic examination, when the tumour is seen

growing from the wall of the bladder like a tiny oak tree, with its delicate branches waving gently in the clear water. If the growth has undergone early malignant changes, its base will be more sessile and the villi covering will be fused together. These appearances seen in the bladder on cystoscopic examination would appear to have clearly demonstrated in all cases the primary source of the bleeding and no further investigation would seem to be necessary. This is not the case, as occasionally the growth within the bladder is secondary to a similar tumour growing within the renal pelvis, and therefore in such cases it is wise to examine both kidneys by ureteral catheterization and pyelography to settle this point.

If the bleeding be due to a renal tumour, it is to be anticipated that the bladder will appear healthy. Possibly you may be fortunate enough to observe blood being ejaculated from one or other ureteral orifice. Whether such be the case or not, ureteral catheterization is now carried out, and when doing so it is very important to observe carefully the fluid as it escapes from the catheter on its entrance into the renal pelvis. If the urine coming from it is then seen to be tinged brown from old blood, this indicates an active pathological lesion within the renal pelvis. If, when the tip of the catheter has entered the renal pelvis, bright blood at once flows from it and the flow suddenly stops, it is probable that the point of the instrument has entered a delicate tumour growing into the renal pelvis and thus caused active bleeding with subsequent clotting of the blood within the lumen of the catheter. If the urine collected by ureteral catheterization at first flows clear and later becomes tinged with blood, this is an indication of no pathological significance, as it is due to the tip of the catheter rubbing against the delicate mucous membrane of the pelvic wall and causing thereby slight bleeding.

Always carry out bilateral ureteral catheterization, using X ray ureteral catheters, for, not only is the single functioning kidney of common incidence, occurring as it does, in our experience, once in every hundred cases, but also it is possible for a patient to have two ureteral orifices, normally placed and secreting freely, and for that patient to have only one renal organ, a unilateral fused kidney. If bilateral pyelography is done and the kidneys are shown to be normally placed, the possibility of this malformation, which occurs once in ten thousand cases, being present is excluded. If a pyelogram has been taken only on one side, but the X ray catheter passes up to the region of the other kidney and secretion comes from it, the assumption is warranted that a normal organ is situated there.

Renal Enlargement.—As has been mentioned, renal enlargement associated with hæmaturia is very suggestive of the presence of a tumour. This syndrome may owe its origin to other causes, and of these the one most liable to lead to an error in diagnosis is congenital multiple cystic disease of the kidney. The characteristic pyelographic appearance of this malformation, however, will at once differentiate it from a case of tumour.

Alteration of the Pyelographic Contour.—I would now consider with you the value of pyelography as a means of diagnosing the presence of renal tumours. As you are aware, the delineation of the contour of the renal pelvis and calyces until recently was accomplished only by the injection through a ureteral catheter of a medium opaque to X rays, a method we now describe as that of infusion urography. More recently there has been introduced the method of excretion urography; a salt rich in iodine is injected into the blood stream, and during its course of excretion by the kidneys and its passage along the urinary channel photographs are taken and these cavities thus delineated. This method of excretion urography has proved of the very greatest value as an aid to diagnosis. The simplicity of the technique with which it is carried out and the absence of the intimate examination that is necessary in the older method have, however, led in certain cases to its being used in preference to infusion urography with an occasionally unsatisfactory result. Perhaps the best illustration of this is where it has been used to diagnose the presence of renal tumours with results that are often fallacious and in consequence dangerous.

It is important to bear clearly in mind the difference between the two methods and their respective spheres of usefulness. Infusion urography, in which the fluid is instilled into the renal pelvis through a ureteral catheter, is a means whereby the contour and capacity of that cavity is delineated. It is a demonstration of the normal or morbid anatomy of the organ equally well carried out in the living or the dead; it is a method to use when a demonstration of form is desired. Excretion urography, on the other hand, demonstrates function; it is not an anatomical but a physiological test. A running stream is photographed and by inference the rate of flow can be estimated. This is indicative of the functional activity of the kidney, but it should never be depended upon to demonstrate the contour of the pelvis, as, naturally, from the nature of the process, irregularity of the shadow is a constant feature. It varies as much as a highland stream in spate.

The diagnosis therefore of the presence of a renal tumour will be made by infusion urography. Excretion urography, as we shall see later, is employed to estimate the degree of malignancy of the tumour.

THE ORIGIN OF RENAL TUMOURS.

Before the various tumours met with in the kidney are considered, their common source of origin should be studied. Renal tumours can be placed in two groups: (i) those which are referable to the developed organ, and (ii) those which are explained by reference to the primordium, or foundation tissue, out of which the kidney is made, and thus it is convenient to refer to the mode of development of the kidney. The uriniferous tubules which form the bulk of the adult organ arise from the metanephros of the embryo. The ureter, renal pelvis, calyces and collecting tubules arise from a bud which grows out from the Wolffian duct and joins with the metanephric tubules. The channel thus formed is detached from the Wolffian duct and implanted

into the urinary bladder. If the tubules of the Wolffian duct portion of the primitive kidney fail to make proper junction with the tubules of the metanephrogenic portion, there is a partial failure in the mechanism of conduction of the excreted urine and a cystic condition, of a greater or less degree according to the extent of the maldevelopment, is produced. Thus what may be considered a variety of new growth of the kidney results, a congenital cystic kidney.

If in one part of the kidney the development has not proceeded according to plan, the misplacement or malformation of tissue *in utero* may result and from it arises the embryonic kidney tumour which may contain both constituents of the kidney, the metanephrogenic blastema and the ureteric diverticulum of the Wolffian duct.

The Origin of the Hypernephroma.

One more developmental anomaly of great importance remains for consideration, and that is bound up with the relation of the adrenal to the kidney. On this relationship much renal tumour pathology has been founded. Grawitz, in *Virchow's Archiv* in 1883, stated that the hypernephroma was developed from an adrenal rest shut off within the kidney substance, and at first this idea was widely accepted. The tendency now is to regard the majority of these tumours as being clear celled papillary adeno-carcinomata arising from the secreting tubules of the kidney itself. Some go so far as to dispute the actual existence of the hypernephroma, and Nicholson concludes his consideration of this question as follows:

> Although Grawitz's theory may not have been disproved to the satisfaction of everyone, I submit that it has most certainly not been established, and that a tumour of the kidney has yet to be described whose structure and behaviour are the same as those of the epithelial neoplasms of the suprarenal cortex. Renal hypernephromata do not indicate that accessory suprarenals, which are found with a greater or lesser degree of frequency over a comparatively wide area of the body, are predisposed to tumour formation. The only case that satisfied the requirements of a genuine epithelial tumour of an accessory suprarenal is that of Bovin. It was found, not in the kidney, but in the broad ligament of a woman of twenty-eight, who for nine years had suffered from symptoms of suprarenal virilism, which improved after removal of the tumour. Should such a neoplasm ever be described in a kidney, let us hope that it will be in a child, or in a woman before the onset of the menopause.

In this connexion I may be allowed to quote what I have said elsewhere:

> You will observe that Nicholson doubts their existence, but you will note that he acknowledges that accessory suprarenals are found with a greater or lesser degree of frequency over a comparatively wide area of the body. We may be in agreement that these adrenal rests are not predisposed to tumour formation, but at the same time it must be acknowledged that they may be the site of tumour formation unless you are going to claim for them a fortunate immunity from neoplastic disease, such as is possessed by no other tissue in the body. I do not ask you to accept Cohnheim's theory, but only the law of averages. You will also observe that he will accept as a genuine hypernephroma only one where it was proved to be producing a functional secretion, the effect of which was modified by the removal of the growth. Surely, if such is to be insisted on for every glandular tumour, the proof of their source of origin will

be difficult to establish in many. The origin of the hypernephroma from adrenal rests in the kidney has been controverted on three grounds. The histological ground is that there is a marked structural difference between carcinomata of the suprarenal cortex and renal hypernephromata. The biological ground is the fact, as Glynn has pointed out, that epithelial neoplasms of the suprarenal cortex as the result of the physiological activity of these cells produce a diminution of female and the development of certain male characteristics in women before the menopause as well as precocity in children of either sex, and since this feature has never been associated with hypernephromata of the kidney, the origin of the latter from accessory suprarenals is said to have been disproved. The anatomical argument is that hypernephromata have been observed to originate primarily in the medulla of the kidney, a situation in which adrenal rests have not been observed. All I would say is that as regards the first argument a resemblance exists that appears to have deceived many able observers. As regards the second, the clinical manifestation of a functional secretion is rarely present from tumour growth, and as for the third I think it is probable that an adrenal rest in this situation will still be found.

Thus, as regards hypernephroma, I am still a "die hard". I will acknowledge that the euphony of the word probably has made us as clinicians use it more frequently than is justified. It is a kindly expression and comforting to the patient and his relatives. We, however, will be more careful in the future and observe its use more strictly.

The type of epithelium lining the ureter, pelvis and calyces is transitional, and, as the term indicates, it is of a type which is not so highly developed as the stratified squamous epithelium of the skin, or even that of the vagina which is a structure of Müllerian duct origin. None the less, this epithelium is lepidic (Adami) in type and epidermoid in its developmental tendency. It is not surprising to find that tumours of the renal pelvis and perhaps of collecting tubules are of epidermoid carcinoma type and may even present all the characteristics of a true squamous epithelioma.

CLASSIFICATION OF RENAL TUMOURS.

A convenient classification of renal tumours is as follows:

I. Primary renal tumours.
  1. Of epithelial type.
    (i) Papilloma of pelvis.
    (ii) Papillary carcinoma of pelvis.
    (iii) Epidermoid carcinoma of pelvis.
    (iv) Adenoma.
    (v) Papillary adenocarcinoma: (*a*) with clear cells, (*b*) with granular cells.
    (vi) Alveolar adenocarcinoma.
  2. Of connective tissue origin.
    (i) Fibroma.
    (ii) Lipoma.
    (iii) Myxoma.
    (iv) Angioma.
    (v) Sarcoma.
  3. Tumour due to developmental abnormality.
    (i) Mixed tumour (embryonal adenomyosarcoma).
    (ii) Hypernephroma (renal tumours of adrenal tissue).
  4. Of perinephric fat and connective tissue origin.
    (i) Lipoma.
    (ii) Fibroma.
    (iii) Sarcoma.

II. Secondary tumours.
   1. Melanocarcinoma.
   2. Squamous celled carcinoma.
   3. Glandular carcinoma.
   4. Sarcoma.

Certain of these are of rare occurrence, and others, such as the fibroma, although commonly met with in the *post mortem* room, are, from the clinical standpoint, of no significance. The tumours with which the clinician especially has to deal are: (i) Papilloma of the pelvis. (ii) Papillary carcinoma of the pelvis. (iii) Epidermoid carcinoma of the pelvis. (iv) Papillary adenocarcinoma, with clear cells (which at one time was classified as a hypernephroma). (v) Papillary carcinoma, with glandular cells. (vi) Alveolar adenocarcinoma. (vii) Angioma (as an occasional cause of hæmorrhage). (viii) Mixed tumour or embryonal adenomyosarcoma of infants. (ix) Hypernephroma (if we still allow that such exists).

PAPILLOMA OF THE RENAL PELVIS.

Papilloma of the renal pelvis may be regarded as an innocent new growth possessing a very high degree of potential malignancy. It grows from the lining membrane of the renal pelvis or calyces into the lumen of the channel without invading the renal parenchyma. The delicate branching villi consist of a central core of connective tissue cells and large blood vessels covered by transitional epithelium. The growth, as has been mentioned already, may lose its innocence and become malignant, and, as occurs with similar growths within the urinary bladder, the earliest evidence of this is seen at the base of the tumour, the peripheral villi remaining innocent in structure.

The clinical features are thus usually associated with a history often of years' duration with little or no impairment in general health. Intermittent hæmaturia occurs, and possibly the passage of pencil-like clots in the urine with associated mild colic or more severe colic when this is due to temporary blockage of the lumen by the tumour growth.

The presence of the growth within the lumen of the pelvis is of itself not likely to produce a degree of enlargement of the kidney such as to render it palpable. On cystoscopic examination a daughter tumour may be seen grafted on to the wall of the bladder. The ureteral catheter is passed with ease up into the renal pelvis and, if active hæmorrhage has recently ceased, it is probable that urine tinged brown from old blood will escape. The impact of the catheter against the villi within the pelvis seldom produces active hæmorrhage. An X ray photograph taken with the catheter *in situ* shows no abnormality. After the introduction of the pyelographic medium the contour of the renal pelvis and calyces appears normal. On careful examination, however, the density of the opacity within the pelvis is seen to vary, and thus the shadow outline of the growth within the cavity is obtained. A delicate soft photograph is required to demonstrate this appearance, and it is well worth while to repeat the injection to confirm this observation if doubt

exists, as the appearance is dependent on the density of the tumour being less than that of the pyelographic medium, and thus the diagnosis rests on the demonstration of a slight alteration in the density of the shadow.

Examination by excretion urography shows the renal functional activity of the affected kidney to be unimpaired, the rate and amount of excretion of the drug being normal. When the kidney is exposed at operation, it is usually readily mobilized and its contour appears normal. The vessels at the hilum are readily collapsed when grasped between the fingers, but the pelvis feels distended by a structure of fleshy consistence. In view of the assumed innocence of the growth, naturally there may be hesitation in proceeding forthwith to nephrectomy. The surgeon may be tempted to open the pelvis and examine the interior—an error to be avoided, as tumour cells may thereby be liberated into the perinephric space, where they may become grafted to form later a recurrent tumour mass. In the light of our present knowledge, nephrectomy is indicated, and it should always be combined with a complete ureterectomy. Some, like Beer, go further and recommend the addition of a localized cystectomy, removing a small portion of the bladder at the site of the implantation of the ureter. Personally I have reserved this procedure for those cases in which a daughter tumour was present at the lower end of the ureter.

Two further points I would emphasize. The first is that a daughter tumour may be present in the ureter and intangible. The other point is to remember that it was mainly the occurrence of hæmaturia that brought the patient to the surgeon, and it was when this was shown to be due to the presence of a growth that consent was obtained to the sacrifice of the kidney as the price of good health. If, in later months or years, blood should again appear in the urine, the alarm to the patient is very great. If in these circumstances the kidney was excised for papilloma of the renal pelvis, suspect the stump of the ureter as the source of the bleeding, catheterize it and take a ureterogram, and having confirmed your suspicion of recurrence in this site, excise the stump and the site of implantation of the ureter into the bladder.

R.Y. suffered from a villous papilloma of the renal pelvis. He was a man aged forty-four years. The only symptom he had was blood in the urine, which had been present for one week. Otherwise he appeared to be in perfect health. Cystoscopic examination showed the bladder to be healthy and infusion pyelography showed what was taken to be a villous papilloma occupying the renal pelvis. The kidney and right ureter were removed and a cure followed. When the kidney was examined later the histological structure of the tumour was seen to be that of a simple villous papilloma. (See Figure I.)

MALIGNANT PAPILLOMA.

A malignant papilloma is clinically extremely difficult to differentiate from a simple villous growth.

M.H. demonstrated certain of the features characteristic of this disease. He was a man, seventy years of age, who had undergone the operation of prostatectomy. For four years he had suffered from intermittent hæmaturia, the source of which was ultimately traced to the right kidney, where a growth

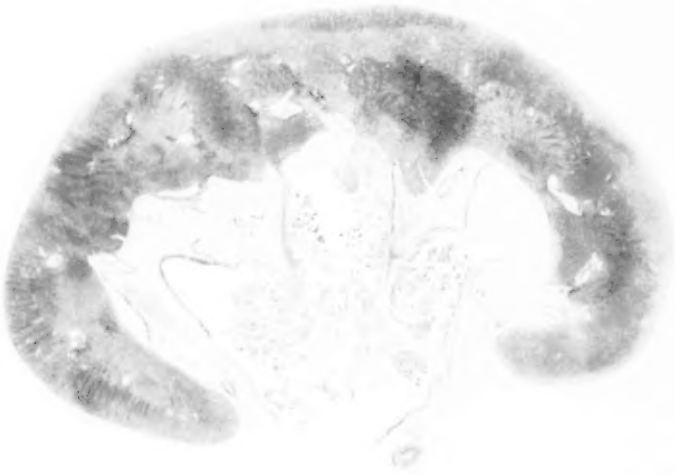


FIGURE I. Villous papilloma of the renal pelvis.

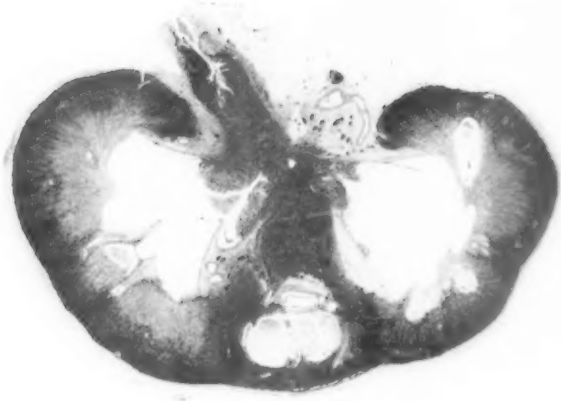


FIGURE II. Epidermoid carcinoma of the kidney.

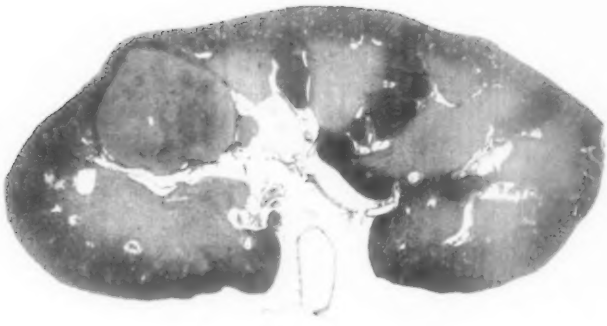


FIGURE III. Very early hypernephroma of the kidney.

was revealed invading the pelvis. The kidney and ureter down to the pelvic brim were removed, and subsequent examination showed the growth to be a malignant papilloma invading the renal pelvis. Two years later blood reappeared in the urine, and the source of this was shown to be a recurrent tumour in the stump of the left ureter. The ureter and adjacent portion of the bladder wall were excised. There has been no further bleeding, and a cure would appear to have resulted.

A malignant papilloma forms a sessile growth denser than the innocent tumour. It invades the adjacent renal parenchyma. On pyelographic examination two features are thus revealed. The first is an irregularity of the contour of the pelvis in the situation where the sessile growth is invading it. The second, an obliteration of the drainage system at the point where the parenchyma is being invaded, is usually demonstrable. By excretion urography the kidney is revealed to be functionally active.

EPIDERMOID CARCINOMA.

Epidermoid carcinoma of the renal pelvis is sometimes called a papillary epithelioma. In this disease the clinical history may reveal a source of persistent irritation of the mucous membrane lining the pelvis, such as the presence of a calculus or leukoplakia. In the majority of cases, however, no such irritation can be demonstrated.

This was so in the case of M.R., the predominant feature of whose case was the presence of prostatism due to simple prostatic hypertrophy. As not infrequently occurs with such patients, he suffered from intermittent hæmaturia, and when the interior of the bladder was viewed a pronounced degree of intravesical herniation of the prostate gland was observed. The ureteral orifices could just be seen, and, to our surprise, urine tinged with blood was noted coming from the right ureteral orifice. Ureteral catheterization confirmed the source of this to be in the renal pelvis and pyelographic examination showed the characteristic appearances of this variety of malignant renal tumour, the growth being situation in the middle of the kidney, where the drainage system was obliterated. The appearances seen were taken to warrant immediate operative treatment, and it was anticipated that nephrectomy would be found to be indicated. The kidney, when it was exposed, at first sight appeared healthy. It was of normal size and contour, but felt of a slightly firmer consistence in the centre of the body. As is commonly the case, inspection of the organ in the operating theatre told us much less than what we already knew by the pyelographic examination, and that information we considered so conclusive that we felt warranted in removing an organ which was to all external appearances healthy. Nephrectomy was therefore performed. When the kidney was examined later an epitheliomatous ulceration of the mucous membrane lining the pelvis with invasion of the parenchyma in the middle of the kidney was revealed. Its structure was that of an epidermoid carcinoma. (See Figure II.)

When examined by excretion urography the functional activity of the kidney in these cases is poor, no shadow or only a faint one being observed.

PAPILLARY ADENOCARCINOMA OF THE KIDNEY.

The majority of tumours of the kidney belong to the group of papillary adenocarcinoma of the kidney. Ewing has remarked that "most of them are recorded in literature as hypernephromata, so that statistical

data is scanty and unreliable". It is especially the papillary adenocarcinoma with clear cells which has been classified as a hypernephroma. At the same time, as I have already mentioned, it would appear that, although of rare incidence, there is a definite renal tumour which is a definite clinical and pathological entity and which we desire still to designate by the name of hypernephroma.

HYPERNEPHROMA.

Both clinically and pathologically hypernephroma is of a low degree of malignancy approaching innocence. It reveals its presence by the local signs of intermittent hæmaturia and renal enlargement. It produces no apparent impairment of the patient's general health. It commences as a slow growing encapsulated neoplasm within the renal parenchyma. By its slow growth it displaces the adjacent renal tissue, so that the neighbouring calyces are thus drawn out and flattened and elongated, and these surround an area devoid of calyces, the site of the growth in the kidney. The appearance seen on pyelographic examination by infusion urography is thus characteristic, and, as the renal tissue, apart from the actual site of the growth, is healthy on examination by excretion urography active normal secretion is observed to be present in it. The growth tends to become less innocent as it grows older, and ultimately it ruptures its capsule and often thereby invades the renal vein, extending along it in contact with its walls, but not infiltrating the walls, projecting into the vein like a finger within a glove. The return of blood by the renal vein being thus slowly impeded and ultimately arrested, a collateral venous circulation is developed through the perinephric tissue, where, in place of minute venous channels, normally almost imperceptible, large tortuous veins may be found. The tumour may also rupture into the renal pelvis, and this highly vascular growth bleeds readily, spontaneously, or to the touch of the point of the ureteral catheter.

In an early case a small encapsulated golden tumour is seen arising up out of the renal tissue (see Figure III). Kettle's excellent description of it cannot be improved upon:

> The naked eye appearance of a hypernephroma is very characteristic and renders it possible to make a diagnosis from a macroscopic examination in a high proportion of cases. In typical examples there is a primary encapsulated tumour surrounded by daughter tumours, which diminish in size as the limits of the growth are approached. Unaltered areas of tumour tissue are of a yellowish colour, but the cut surface has usually a mottled, deeply hæmorrhagic appearance, for the growths are exceedingly vascular, and there is nearly always an extensive extravasation of blood. Central cystic degeneration of the larger nodules may occur, but more commonly there are areas of mucoid degeneration mingled with zones of dense fibrosis, the appearance as a whole suggesting very strongly the presence of cartilage. The microscopic structure is of great interest. The tumour cells are cuboidal in shape, but they are likely to become distorted as the result of mutual pressure; sometimes they are distinctly columnar. They have a small round, deeply staining nucleus, and are distinguished by the clear, vacuolated appearance of their cytoplasm, an appearance due partly to hydropic distention, and partly to the solution, in the process of preparation, of the fat and glycogen present in the fresh state. Their arrangement is extremely variable. Trabeculæ

or solid alveoli are common, and the latter may exhibit a lumen from the degeneration of the central cells. In some tumours there is a true acinous formation, and in others the cells are often disposed in a papillomatous manner around a vascularized connective tissue core. Occasionally cystic spaces, which may be partly filled up by an ingrowth of the lining cells, are formed, and every now and again the cells may be loaded with pigment granules, probably as the result of old hæmorrhages. Except in the older parts of the tumour the stroma is always extremely scanty and the groups of cells are separated by, and rest upon, delicate capillaries which consists of little more than tubes of epithelium. The vascular supply is always abundant, and the capillaries are often dilated into large sinusoids.

The structure of the growth resembles closely that present in the *stratum glomerulosum* of the adrenal cortex.

PAPILLARY ADENOCARCINOMA WITH CLEAR CELLS.

The papillary adenocarcinoma with clear cells is a common variety of renal tumour, clinically almost indistinguishable from a hypernephroma, especially of the more malignant type. A histological differentiation is also frequently difficult, as it is possible to have in one tumour two types of growth; structure is apparently influenced by environment, one part being like that of a hypernephroma and the other having the typical papillary structure. The adenocarcinomata with clear cells are not encapsulated tumours, and show greater tendency to invade the surrounding renal tissue. Histologically they have a papillary architecture.

On clinical examination the kidney is usually palpable, being enlarged by the presence of the growth. The pelvis is early invaded; thus hæmaturia with the passage of pencil-like clots often occurs and sometimes is associated with mild colic. The pelvic portion of the tumour here also bleeds readily to the touch of the ureteral catheter, and the renal vein is also frequently invaded. The pyelographic contour by infusion urography shows distortion of the pelvis and calyces as in hypernephroma. By excretion urography the renal functional activity is found to be impaired, but not in abeyance.

The Operative Treatment when the Growth has Invaded the Renal Vein.

The problem from the standpoint of the operative treatment that these two types of cases present is the invasion by the growth of the renal vein. The possible presence of this complication should be anticipated, and the surgeon, being thus forewarned, be forearmed to meet it. Immediately the perinephric box is opened the story is told. Large tortuous veins are seen coursing through the perinephric fat carrying the blood return from the kidney to the abdominal parietes by these abnormal channels. The situation is one that tests admirably the surgical skill of the operator, and calls for that accurate balancing of risks that forms the basis of skilful surgical practice. Careful ligation of the large collateral veins in the perinephric box would mean that the blood could no longer leave the kidney, which in consequence would become intensely engorged and profuse bleeding would result. The difficulty in these cases is therefore twofold: the control of the

collateral circulation and the treatment of the neoplastic thrombus. To overcome the former the wound in the abdominal parietes should be enlarged, if necessary, to afford free exposure for rapid mobilization of the kidney. If this is achieved by blunt dissection and if the hand is carried round the kidney in the perinephric fat, the veins of the collateral venous return will be torn and severe bleeding will ensue. On the other hand, if each vein is deliberately isolated and ligatured, the interference with the venous return, which with each ligation becomes greater, will lead to extreme engorgement of the kidney and severe venous bleeding. An intermediate course should be followed. The main collateral venous trunks are isolated and ligatured, and then by a rapid hand dissection the kidney is mobilized and the pedicle grasped and the renal artery compressed, the venous bleeding, which at this stage may be profuse, being disregarded. When the pedicle is grasped, a sensation is experienced which, when once felt, is easily recognized again—that of the renal vein filled by a neoplastic thrombus. It feels like a small gloved finger. The course now to be followed will depend upon the facility of access to the renal pedicle, and whether it is the right or left kidney which is being dealt with. On the left side an attempt to remove the entire thrombus concurrent with the excision of the kidney is justified, and an effort should be made to palpate its limit within the vein. To do this traction is exercised on the mobilized kidney, and the renal vein is lightly grasped between the two fingers, which are pressed inwards until they are felt to slip over the end of the growth within the lumen and grasp the collapsed walls of the vein. Fortunately, the neoplastic thrombus is not adherent to the walls of the channel, and as it is thus mobile the closed fingers are now withdrawn outwards and the thrombus is milked back along the vein towards the kidney. The feasibility of this treatment having been thus established, the renal artery is now ligatured, and, the previous manœuvre having been repeated, the vein is ligatured and divided.

This is the ideal operative technique in such a case, but it is possible only where the access is good and the renal enlargement due to the presence of the tumour not unduly great. It is most suitable for practice on the left side, and if it is attempted on the right side the situation of the inferior *vena cava* should be carefully defined.

In the majority of cases a second alternative line of treatment is recommended. In it the renal artery and vein are ligatured independently, the neoplastic thrombus being divided, and a portion of the growth is thus left within the lumen of the vein. The kidney having been removed, the wound cleansed and a perfect exposure of the ligatured stump of the renal pedicle having been obtained, the vein is isolated and grasped, traction is made on it, and the limit of the growth is discovered by touch. On the left side the ligatured vein is dissected inwards to beyond the limit of the growth. If this reaches beyond the site of entrance of the ovarian or spermatic veins, the tumour is sometimes noticed extending down these channels and a complete removal of these veins as widely as possible should be done. The renal vein is again

tied, this time beyond the limit of the invading tumour. On the right side the tumour growth may be found projecting into the inferior *vena cava* and at first sight it might appear incapable of removal, but it may be possible to remove it with relative ease in certain cases. The method to be followed is to enlarge the incision if necessary and to get a good exposure with perfect illumination of the depth of the wound, and to define by dissection the inferior *vena cava* above and below the entrance of the right renal vein for a matter of 5·0 or 7·5 centimetres (two or three inches). This channel is seen distended with blood, but the blood pressure within it is at zero, so that the flow through it is readily controlled by pressure. The first assistant presses lightly on the inferior *vena cava* above and below with the outer borders of the little fingers of each hand. This pressure is maintained by him until the thrombus has been extracted and the vein again ligatured. To do this the temporary ligature round the vein is removed and the soft malignant thrombus is gently withdrawn from the vein and from within the inferior *vena cava,* and a ligature is again applied to the stump of the renal vein.

PAPILLARY CARCINOMA WITH GRANULAR CELLS.

The papillary carcinoma with granular cells is a more malignant tumour than those already described.

M.W. presented a case of this nature. She was fifty-five years of age, and had suffered from slight pain in the right loin accompanied by hæmaturia and no other urinary symptoms. Examination by infusion urography showed a destruction of the drainage system of the middle of the kidney to be present, due to a tumour. When the kidney was examined after it had been excised, a tumour was seen in the middle of the body, its structure being that of a papillary carcinoma with granular cells.

ALVEOLAR ADENOCARCINOMA.

Alveolar adenocarcinoma is a non-encapsular, highly malignant tumour which invades the renal parenchyma by infiltration. It originates from renal tissue. Such tumours form solid growths in which necrosis and hæmorrhage are rare. They invade the renal veins and lymphatics and readily produce metastases in distant organs. The tissues invaded become incorporated in a solid mass of new growth in a manner entirely different from that observed with the hypernephroma or papillary adenocarcinoma with clear cells. From the nature of the growth it is not surprising that hæmaturia is not a clinical feature in these cases, even when the growth has produced a palpable mass and X ray examination may show a secondary deposit in the spine. The appearances seen on pyelographic examination by infusion urography are liable to be deceptive, in that, owing to the rapid infiltration of the renal parenchyma, the contour of the pelvis and calyces may appear normal when the opaque medium is infused by a ureteral catheter. The vital test of function by excretion urography is here most valuable, as it will reveal virtually an entire absence of renal function, no photographic evidence of the kidney or pelvis being evident.

An illustrative case was that of A.F., a man, aged twenty-nine years. He stated that he had suffered from pain across the small of the back for three

or four months. His left kidney was felt to be enlarged and slightly irregular in contour. The preliminary X ray examination showed a secondary deposit in the third lumbar vertebra. Infusion urography showed the pelvis and calyces to be dilated, but the pyelographic contour otherwise was only slightly deformed. By excretion urography the right kidney was shown to be healthy; the left gave no photographic evidence of functional activity. The patient died, and at the *post mortem* examination, in addition to the renal tumour, metastases were found in the perinephric lymphatic glands, the skeleton and the lungs. The growth on section was seen to be an actively growing tumour, possessing at parts a tubular structure, with many cells undergoing mitosis.

The features that enable this type of growth to be recognized are its rapidity of growth, the effect it has produced on the patient's general health, as is evident in the loss of weight and the cachectic appearance, the absence of hæmaturia, the localized discomfort and the palpable mass in the loin, the pyelographic contour by infusion urography which is so little deformed, and the very marked interference with function as revealed by excretion urography.

A thorough preliminary X ray examination of the skeleton is indicated in view of the possible presence of secondary tumours in the bones.

The Operative Treatment when the Renal Glands are Involved.

The operative treatment of an alveolar carcinoma may prove difficult. We approach it anticipating this and prepared for a bad ultimate prognosis. No undue perirenal vascularity is likely to be met with from the development of a collateral venous circulation. The difficulty likely to be encountered is fixation of the renal pedicle and involvement of the renal glands. Occasionally it is possible to remove the kidney and subsequently excise the involved renal glands, especially on the left side, and sometimes it is justifiable to remove the kidney alone when the glands are involved but cannot be excised, as life is thus prolonged. If this latter course is followed, particular care should be given to careful ligation of the renal pedicle. The renal vessels reach the kidney by passing between the enlarged and firm renal lymphatic glands, the site of secondary carcinoma. These enlarged glands lie close up to the hilum, but when traction is exercised on the kidney the vessels will be pulled out from between the glands. If they are now ligatured when pulled taut and are allowed to rebound when divided, the ligature may easily be pulled off the vessels which retract between the enlarged glands, and the bleeding that follows is most difficult to control. To avoid this danger the ligature should be applied when the pedicle is lax, and the vessels should be divided so as to leave an adequate and safe stump.

THE MIXED RENAL TUMOUR OR EMBRYONAL ADENOMYOSARCOMA.

The mixed renal tumour or embryonal adenomyosarcoma is one of the most characteristic tumours of the kidney. It occurs frequently in infants and is of rapid growth, attaining in some cases to a very great size and ultimately proving fatal, but metastases are of exceptional occurrence. These growths form solid fleshy tumours which are sometimes

described as sarcomata, but on examination they are found to possess a more complicated structure of glandular, fibrous, muscular and highly cellular tissue. Strands of cartilage are sometimes encountered and often bone has been observed.

B.H., aged three years, suffered from this disease. Fully one-half of the abdominal cavity was occupied by a tumour mass. On pyelographic examination the renal pelvis was shown to be grossly distorted with obliteration of certain of the calyces and elongation of others due to invasion and displacement of the renal tissue by the growth. The kidney was excised, the route of access chosen being that most suitable for such a case—the transperitoneal lumbar approach. This not only provided free access, but also protected the colon which was stretched over the convexity of the swelling. By careful dissection the colon, posterior parietal peritoneum and the blood vessels were mobilized and displaced inwards. While this was being done the abdominal viscera were carefully packed off, as in more than one case of this disease there has been found on the posterior surface of the bowel and between it and the kidney a perineoplastic abscess. Such a small abscess was found to be present here. The young patient made a successful recovery and is alive and well today, ten years after the operation.

From what has been said I consider we are warranted in claiming that not only is the presence of a renal tumour able to be recognized accurately, but also that an approximate diagnosis of its type and structure can be obtained. This differentiation is made partly on the grounds of the clinical history and local examination, but mainly by the combined use of infusion and excretion urography. I would again remind you of the relative rôles of infusion and excretion urography. Infusion urography indicates form; excretion urography indicates function. The former is the primary diagnostic aid for the recognition of the presence of a tumour of the kidney; the latter, by indicating the state of the adjacent renal parenchyma, is a valuable aid in identifying the type of growth that is present. This knowledge not only permits of a more accurate pre-operative prognosis, but also thereby gives warning of some of the complications that may be met. Of these the most important are the daughter tumour concealed in the ureter in a villous papilloma of the renal pelvis, the accessory venous circulation in the perinephric fascia due to a neoplastic thrombus in the renal vein in cases of hypernephroma or papillary carcinoma, the involvement of the renal pedicle and the adjacent lymph glands in cases of alveolar carcinoma.

In other types of tumour, such as the epidermoid carcinoma and the embryonal carcinoma and the rare tumours, information of similar value is also obtained. It amounts to this: "The degree of malignancy of a tumour of the kidney is in inverse proportion to the functional activity of the organ as a whole."

Two years ago at Niagara Falls, in the Dominion of Canada, I spoke these words, and further experience since then has further strengthened my belief in the contention, and I would conclude, as I commenced, with the remark that today as then the only cure for a tumour of the kidney is its removal by the surgeon's knife. Thus early and accurate diagnosis is of vital importance in facilitating the success of such treatment and the prospect of a permanent cure is thereby enhanced.

TEN YEARS' EXPERIENCE OF DIATHERMY FOR PAPILLOMA OF THE BLADDER.

By J. W. S. Laidley, M. S. S. Earlam and A. B. Walker-Smith.

[From the Departments of Urology and Surgery, Royal Prince Alfred Hospital, Sydney.]

This address is based upon clinical material seen by the past and present members of the Department of Urology of the Royal Prince Alfred Hospital since its establishment in 1925, and this basis is presented in the form of a statistical survey of the results of the treatment by diathermy of all patients suffering from papilloma and carcinoma of the bladder. The repetition of the everyday details of such aspects as the signs and symptoms, methods of investigation and indications for operation in these patients would add little to our present store of knowledge. The paper will therefore concern itself almost entirely with a discussion of some of the many problems that constantly arise in this branch of surgery, and with the conclusions regarding some of these which have been arrived at from a study of our successes and failures. Many patients were able to be traced through the good offices of the Registrar-General, and thanks are also due to the Government Statistician for help with the graphs.

Historical.

It was in 1910 that Beer and Keyes placed surgical diathermy on a practical basis by their work in connexion with high frequency currents. Previously a few workers had used an electrode for the destruction of tissue, but it was not until after 1910 that the use of electrically generated heat became at all widespread. Cystoscopy at that time was well established as a diagnostic measure, but no method was known by which it was possible to apply controlled heat to a water-filled urinary bladder through the cystoscope. It was the work of these two men which enabled this to be done, and almost as soon as the possibilities were realized a revolution took place in the treatment of vesical papilloma.

Before this time surgical treatment consisted of excision in some form or other. This ranged from the barbarous and useless "avulsion" with villous growth forceps, through local excision, to wide excision or partial cystectomy in which the whole thickness of the bladder wall was excised. Partial cystectomy could be performed only when the growth was not too widespread, and when it was in a suitable position on the bladder wall. In any advanced case the surgeon's choice lay

between palliative cystostomy and complete cystectomy with transplantation of the ureters. It is noteworthy, however, that many surgeons in the "pre-diathermic era" were using the actual cautery on the base of a tumour after excision.

With regard to the results obtained from these methods, the records seem to indicate that the results from avulsion were very bad indeed, immediate recurrence being the rule. The results of local excision were also very bad, and are particularly to be deplored, for it was usually in cases of pedunculated villous papilloma that the surgeon was tempted to use this method. Rapid recurrence occurred, and over a greater area than the original growth. The results of local excision when a cautery was applied to the base of the tumour were far better, and the success met with here must have stimulated the demand for a more practical form of heat. The results of partial cystectomy were good, and compare favourably with those obtained by coagulation methods. However, as indicated above, wide excision was applicable only to those cases in which the growth was not too widespread.

The advances made by the work of Beer and Keyes may be set out as follows:

1. When the bladder was opened suprapubically it was possible to apply an accurately controlled source of heat to a tumour in any situation. Position and size were no longer important. A widespread growth involving the trigone and ureteral orifices could be dealt with as easily as one in the fundus or lateral wall.

2. From the nature of the destructive agent there was no cutting of any kind, and no necessity to manipulate the tumour. Indeed, in most cases the only surgical instrument to touch the growth was the diathermic electrode.

3. Owing to the nature of the current, the heat generated in the tissues was not local, but spread deeply and widely through the bladder wall. It is due to this fact that the results of destruction with diathermy are so good in all but the most malignant types of growth.

4. The greatest advance of all was that it became possible to treat many patients cystoscopically, and thus to avoid open operation. Compare the life of one unfortunate patient who appears in the records, who had seven suprapubic incisions in seven years, with that of a patient who has an initial suprapubic diathermy and subsequent cystoscopic diathermy at intervals of three or six months.

There is a patient attending the department at the present time. He attended first in 1926, when transurethral diathermy was performed under general anæsthesia. Since then he has never been without attention for more than six months, and has had transurethral diathermy to numerous recurrences. He is a coal miner who comes from Newcastle. He arrives in hospital on our operating day, is examined cystoscopically, has any recurrences destroyed under local anæsthesia, and immediately catches the train back to Newcastle. During his eight years of treatment he has been in full and active work.

Although Beer and Keyes published the results of their work in 1910, it was twelve years before a diathermy machine was available at the Royal Prince Alfred Hospital. The first transurethral diathermy was performed in 1922. The diathermic current had been in use elsewhere for many years before that, and the late Mr. Gordon Craig used suprapubic and transurethral diathermy in his private practice as early as 1912.

Modern case records at the Royal Prince Alfred Hospital have been kept since 1910. Consequently we have two approximately equal periods, the "pre-diathermic era" from 1910 to 1922, and the period from 1922 until the present day. There is necessarily some overlapping, but the value of diathermy received such immediate recognition that the transition was relatively sudden. It should be mentioned here that all diathermy has been carried out by means of a bipolar current, and by machines of the spark-gap type.

STATISTICS FROM 1910 UNTIL THE PRESENT DAY.

The general statistics from 1910 to the present day are as follows:

The total number of cases was 301. Male patients numbered 243 or 81%; females numbered 58 or 19%.

Clinical papillomata numbered 121 or 40%; clinical carcinomata numbered 180 or 60%.

The sex incidence and the papilloma-carcinoma ratio are within the limits found by other authors.

The age incidence of the two groups is shown in Table I.

Basis of Classification.—Papilloma and carcinoma have been classified on a clinical basis rather than a pathological one, as in many cases biopsy specimens were not taken.

(*a*) *Papilloma*: Papillomata are single and multiple pedunculated tumours with fronds.

(*b*) *Carcinoma*: Carcinomata are sessile tumours with fronds (the so-called papillo-carcinomata), and include all solid tumours and ulcerative tumours.

Position of the Neoplasms.—The positions of the neoplasms in one hundred cases are shown in Table II.

Operations Performed.—The operations performed in the period 1910 to 1924 are set out in Table III. Those performed in the period 1924 to the present day are shown in Table IV.

Results of Diathermic Destruction of Vesical Papilloma.

The results of diathermic destruction of vesical papilloma are described in two groups.

A. *Suprapubic Diathermy.*—Thirty-three individuals were subjected to suprapubic diathermy, of whom ten have since died. (*a*) Four were operative deaths. (*b*) Two died from papilloma within five years. (*c*) Two died from papilloma after five years or more. (*d*) Two died from other causes within five years.

TABLE I.

Cases of Papilloma and Carcinoma at Various Ages.

Age Group (Years).	Papilloma.	Carcinoma.	Total.
15 to 19	1		1
20 to 24	2		2
25 to 29	5	2	7
30 to 34	7	2	9
35 to 39	9	6	15
40 to 44	10	6	16
45 to 49	8	25	33
50 to 54	13	24	37
55 to 59	16	20	36
60 to 64	17	21	38
65 to 69	14	30	44
70 to 74	14	20	34
75 to 79	5	7	12
80 to 84	1	4	5
85 to 89		1	1

TABLE II.

Position of Vesical Neoplasm in 100 Cases.

Site.	Number of Cases.
Near the ureteral orifices	43
Trigone	15
Bladder neck	12
Lateral walls	12
Posterior wall	7
Anterior wall	7
Extensive involvement of whole bladder	4
Total	100

TABLE III.

Operations, Period 1910 to 1924.

Group.	Number of Cases.
A. *Papilloma.*	
Patients subjected to suprapubic excision	14
Patients subjected to partial cystectomy	1
Patients subjected to transplantation of ureters	1
No operation	7
Total	23
B. *Carcinoma.*	
Patients subjected to suprapubic excision	10
Patients subjected to partial cystectomy	3
No operation	41
Total	54

Fourteen have survived five years or more and are still living. Eight have been operated on within the last five years and are still under observation and in satisfactory condition. One is untraced.

Excluding four operative deaths, two deaths from other causes (not papilloma), eight patients operated on within the last five years, and one who was untraced, fourteen out of the eighteen patients who survived operation, or 77%, are alive after five years or more.

The operative mortality was 13%.

B. *Transurethral Diathermy.*—Sixty-one individuals were subjected to transurethral diathermy, of whom seven have since died. (*a*) Two

TABLE IV.

Operations, Period 1924 to the Present Day.

Group.	Number of Cases.
A. *Papilloma.*	
Patients subjected to suprapubic diathermy	33
Patients subjected to transurethral diathermy ..	61
Patients subjected to suprapubic excision	3
Patients subjected to partial cystectomy	1
Total	98
B. *Carcinoma.*	
Patients subjected to suprapubic diathermy	39
Patients subjected to transurethral diathermy ..	11
Patients subjected to suprapubic excision	3
Patients subjected to partial cystectomy	5
No operation	68
Total	126

In this table the initial operation is the only one taken into account. Subsequent destruction of recurrences, if noted, would greatly increase the figures for transurethral diathermy.

died from papilloma within five years. (*b*) One died from papilloma after five years. (*c*) Three died from other causes within five years. (*d*) One died from other causes after five years.

Seventeen have survived five years or more and are still living. Twenty-two have been operated on within the last five years and are still under observation and in satisfactory condition. Fifteen are untraced.

Excluding four deaths from other causes, twenty-two patients operated on within the last five years, and fifteen untraced patients, seventeen out of twenty patients, or 85%, are alive after five years.

The operative mortality was nil.

Results of Diathermic Destruction of Vesical Carcinoma.

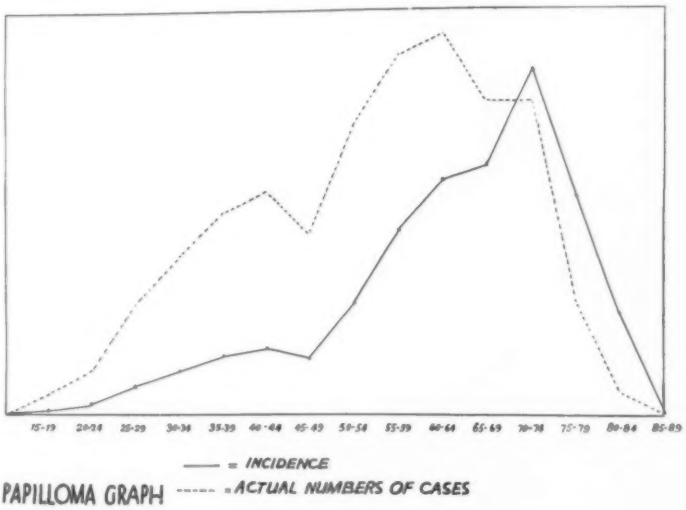
The results of diathermic destruction of vesical carcinoma are described in two groups.

A. *Suprapubic Diathermy.*—Thirty-nine individuals were subjected to suprapubic diathermy, of whom seventeen have since died. (*a*) Three were operative deaths. (*b*) Fourteen died from carcinoma within five years.

Six have survived five years or more and are still living. Eight have been operated on within the last five years and are still living. Eight are untraced.

Excluding three operative deaths, eight patients operated on within the last five years and eight untraced patients, six patients out of twenty who survived operation, or 30%, are alive after five years or more.

The operative mortality was 8%.



GRAPH I.

B. *Transurethral Diathermy.*—Eleven individuals were subjected to transurethral diathermy, of whom five have since died. (*a*) Four died from carcinoma within five years. (*b*) One died from other causes within five years.

One has survived five years or more and is still living. Three have been operated on within the last five years and are still living. Two are untraced.

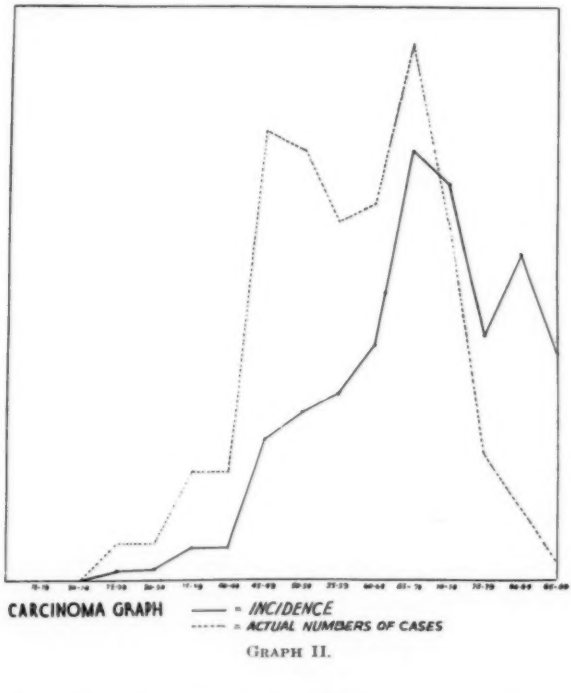
Excluding one death from other causes, three patients operated on within the last five years, and two who are untraced, one patient out of five, or 20%, is alive after five years or more.

Operative Mortality over Whole Series.

With suprapubic diathermy, there were seven deaths in 72 cases, or 10%. With transurethral diathermy, there were no deaths in 72 cases.

Comment on Graphs.

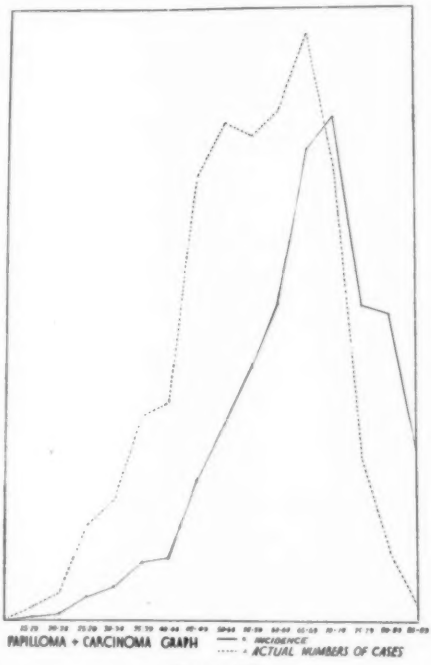
In the three graphs published herewith the dotted line in each instance represents the actual number of cases recorded in each five-year period. The continuous line represents the relative incidence of



GRAPH II.

papilloma or carcinoma among those living at any given age. This is necessarily a far truer representation than the dotted line. The figures were obtained as follows. The Government Statistician was good enough to supply the percentage of the population that was alive in each five-year period. These percentages were divided into the number of cases actually observed in each period, and the numbers obtained were plotted on the graphs. It should be understood that these graphs do not claim to give the absolute incidence of papilloma and carcinoma in New South Wales, but merely the relative incidence.

It will be noticed that in each graph the apparent maximum incidence, obtained by plotting the actual numbers of cases only, occurs about ten years earlier than the maximum incidence obtained from the relative incidence graph. It is also interesting that the incidence of carcinoma remains far higher in extreme old age than is apparent from the usual form of graph employed.



GRAPH III.

TECHNICAL CONSIDERATIONS.

The Suprapubic Operation.

The fear of scar contamination is a very real danger, whether or not non-coagulation methods are employed, and every effort must be made to prevent the tumour cells from coming in contact with the cut edge of the bladder or the incision through the abdominal wall. With diathermy the risk does not seem to be so great, but still exists. It has not been a routine procedure to protect the incision with side towels, but the bladder is swabbed with a little alcohol before sewing up. Recurrence at the fundus has been rare, and we have records of only one case in which a recurrence occurred in the abdominal wall. The reason for this immunity probably lies in the nature of the technique employed. The tumour is touched by no instrument but the surgical electrode, and, when it is pedunculated, this electrode is represented by a pair of Howard Kelly forceps which are applied to its base. The source of current is brought into contact with the handles of the forceps, and when coagulation of the pedicle is complete, the pedicle is divided and the whole papilloma is lifted carefully out of the bladder, still in the grasp of the forceps.

When there is no pedicle the button electrode is simply applied to the tumour, and little by little the whole of the growth is thoroughly coagulated. As a result it is only the outermost cells of the tumour which have any chance of coming into contact with other tissue, and these outer cells are often necrotic and possess but slight power of auto-infection.

We do not consider the recently developed electro-cutting current to be as suitable as the coagulation current for the destruction of these tumours, although coagulation is tedious, and there is a temptation to shorten the procedure by removing as much as possible of the tumour by means of the cutting loop, and then coagulating the base. In any case this method is suitable only when the tumour is a solid one. Here there is something substantial for the loop to cut against, good hæmostasis is secured, and the cut surface of the tumour is safely sealed off by a film of coagulated tissue. When the tumour is pedunculated, the pedicle may be grasped as described above, with Howard Kelly forceps, and first coagulated and then severed with the cutting current. The base, however, should be thoroughly coagulated after the bulk of the tumour has been removed.

When the tumour consists of fronds, the cutting loop is not so satisfactory, and tends to tear away the delicate fronds without proper coagulation. Whether this is detrimental to the prognosis it is yet too early to say, but we feel that it is a retrograde step in the surgical treatment of these conditions, and that the slow but well proved coagulation methods are preferable.

When a ureteral orifice is involved in the growth, very little harm is done as a rule by coagulation. After the slough has separated and the mucous membrane has grown over again, the orifice may be seen in some cases to have lost its valve-like character and become rounded and patulous, though in many others it may appear perfectly normal. A patent orifice obviously increases the possibility of infection reaching the kidney, but complete occlusion in the early post-operative stage, even after extensive diathermy in the region of both orifices, is unknown in this series, and late stenosis is rare. One patient who had trans-urethral diathermy applied to a carcinoma completely concealing the right ureteral orifice required nephrectomy six months later for multiple cortical abscesses, though the orifice looked normal three months after diathermy. One of the most noticeable features of healing after coagulation is the absence of scar tissue formation. We have seen bladders six months after extensive diathermy in which it was impossible to say that the walls were not normal. When the ureteral orifice is involved, the special danger is not that the orifice may become damaged by coagulation, but that the papilloma may extend inside the lumen of the ureter. When this occurs, and the growth can no longer be reached by the electrode, complete nephro-ureterectomy must be performed.

It will be remembered from the statistics that there were seven operative deaths after suprapubic diathermy. Of this number no less than four were due to pyæmia and other suppurative conditions following on closure of the bladder. Of recent years it has been a routine procedure in all suprapubic work of this nature to drain the bladder with a rubber tube of adequate calibre for at least four days after operation. If the bladder is particularly dirty and the coagulation has been extensive, the tube is then changed and the suprapubic wound is kept open for about six more days, by which time most of the sloughs have

separated. After this, healing is allowed to take place, and the wound is kept as dry as possible with an indwelling catheter. In work of this nature, just as in prostatic work, the surgeon is completely in the hands of his nursing staff. It is of the utmost importance for the welfare of his patients that the nursing staff is thoroughly trained in the principles of asepsis, is conversant with the manœuvres of catheterization and irrigation, and appreciates the importance of free and continuous drainage.

In this series there has been no case of alarming or fatal primary or secondary hæmorrhage, and no case has occurred of perforation of the surrounding viscera due to over-enthusiasm in coagulation, entero-vesical fistula being unknown. Lastly, there has been no fatal case of embolism.

The Transurethral Operation.

Many tumours of considerable extent may be destroyed cystoscopically, and the treatment may extend over several sittings at weekly or fortnightly intervals. It is unwise, however, to persist with transurethral methods if it becomes obvious that rapid progress in destruction is not being made. It is better in these cases, or when there is doubt as to the extent of the tumour, to perform suprapubic operation.

The site of the tumour must also be considered. As a general rule, the further away from the bladder neck the tumour is situated, the easier it is to destroy cystoscopically. Consequently it may be necessary to open the bladder to destroy a small tumour growing from the region of the sphincter, while a much larger one on the lateral or posterior wall could be dealt with transurethrally.

Finally, there are few exceptions to the rule that all sessile papillo-carcinomata and all solid growths, unless small and pedunculated, should be approached suprapubically. That is to say, transurethral diathermy should be reserved for the pedunculated papilloma, and only for those which are small enough and sufficiently happily situated for one to be confident of complete destruction.

Biopsy.

There is a wide difference of opinion between surgeons as to whether a biopsy specimen should be taken as a routine or not. It has not been the practice in the department, for two reasons, the first being the fear of dissemination of tumour cells, and the second, that the point of view has always been adopted that all bladder tumours are potentially malignant if not actually malignant, and that no procedure which falls short of complete destruction of the tumour should be countenanced, so that the results of biopsy examination do not affect the management of the case.

The routine collection of biopsy specimens has two points in its favour. It adds to the pathologist's store of knowledge, and in certain

cases it helps to make a more accurate prognosis. Whether these advantages outweigh the disadvantages is doubtful, and while in certain clinics biopsy specimens are always taken, in other clinics they are not.

CASE MANAGEMENT.

There are probably few conditions in which cooperation between patient and medical attendant is so rewarded as in papilloma of the bladder. It must be insisted on from the outset and thoroughly realized by the patient that the condition is one in which recurrence is more the rule than the exception. Once this lesson is learned, the patient will usually report regularly at the correct intervals, if only through fear of having another suprapubic operation.

Whether the initial operation is suprapubic or transurethral, our procedure is as follows. In three months after the operation the patient reports for observation cystoscopy. If there is a recurrence it is destroyed and he is instructed to report in another three months. If clear, he is given a six months' interval, and if clear at the end of that time, he is instructed to report every twelve months. If a recurrence at any time appears, he is again put back to three months, and the interval once more is gradually lengthened. A slight deviation from this routine may be made if the diathermy has been very extensive, when we feel happier if the patient can be examined cystoscopically at two or three successive three-monthly intervals before he is given a six months' interval.

Though it is comparatively easy to insure regular attendance in private practice, in public hospital work the standard of intelligence is lower and many patients will not report without some stimulation. For this reason we established about twelve months ago a follow-up system at the Royal Prince Alfred Hospital. It is the duty of an official to enter the names and addresses of all such patients in a diary under the date of their next attendance. As this time approaches a letter is sent, reminding the patient of the necessity for attendance. Although only in operation for a very short period, this system has already proved to be of great value, and as time goes on it is hoped that its worth will be more and more reflected by an improvement in the statistics.

MALIGNANCY.

A villous papilloma may maintain its comparatively innocent nature for many years without showing any increase in malignancy, and its recurrences may exhibit the same characteristics as the parent growth. Some papillomata, however, acquire more malignant changes, and their recurrences show a progressive increase in malignancy. We do not think that all malignant tumours of the bladder owe their origin to papillomata. Perhaps some may do so, but many appear to be malignant from the beginning.

Sessile papillary carcinomata, some of which are degenerations from villous papilloma, and others malignant *ab initio*, represent a

fairly early stage of malignancy. With regard to the solid tumours which begin as papillomata, the malignant portion gradually infiltrates the base and bladder wall, and, growing more rapidly than the parent growth, tends to become disproportionately large. The parent papilloma is now growing as an appendage from carcinomatous tissue and necrosis occurs. In extreme cases this necrosis may result in the complete disappearance of the papilloma and leave a solid infiltrating carcinoma with no indication whatever of its mode of development.

It is interesting that the solid type of bladder tumour may show very wide differences in malignancy, as determined by microscopic investigation. Although macroscopically all appear extremely malignant, it is always worth while performing a thorough coagulation with diathermy. Many prove to be more innocent than they look, and the results in such cases are good. We are of the opinion, however, that when rectal findings indicate that the tumour is extremely extensive, infiltrating and fixed to surrounding structures, attempts at radical suprapubic coagulation are usually out of place. If a cystostomy has to be performed in these cases, it will be found that diathermy will clean the bladder up considerably and reduce hæmorrhage.

A fact which it would not be out of place to mention here is that though the parent growth may be completely destroyed, and the bladder remain clear of recurrence, secondaries may subsequently be found to have occurred in lymph glands, lung, brain or elsewhere and kill the patient. In one case of this type the bladder had been clear for eight months before secondary deposits appeared in lymph glands. Another patient fell off a tram and apparently died of a fractured skull. At the coroner's autopsy it was discovered that death was due to hæmorrhage from a secondary growth in the brain.

Hugh Young is of the opinion that papillomata which, after the initial destruction, tend to develop large numbers of recurrences, are malignant. He also believes that papillomatosis or Albarran's "villous disease", which is really an extreme form of the same thing, is malignant. This opinion is based on the careful pathological examination of biopsy specimens, and he states that careful search will often reveal one villus, or a portion of one villus, which has developed malignant changes.

Cabot states that ultimately all benign papillomata tend to become malignant, and this may be true if they are left untreated. Nowadays the problem is more complex than this, for the parent tumour can in most cases be destroyed completely, and the question is whether the recurrences of all benign papillomata become malignant. In our series the weight of evidence seems to show that where recurrences continually appear for more than one or two years, malignant changes eventually develop. In other words, there are certain cases which, if left untreated, would develop into a papillomatosis, and, as indicated above, papillomatosis is essentially a malignant condition. On the other hand, cases of widespread papilloma are occasionally seen, untreated for

years, in which the results of diathermy are so good that their malignancy must be very low indeed, and shows little tendency to increase.

RECURRENCE.

It is important to have a clear idea of exactly what is meant by the word recurrence. This a very loose term, and up to the present has been carelessly applied to conditions which are not really recurrences at all. After suprapubic diathermy for a papillo-carcinoma an observation cystoscopy in three months will very often disclose a small amount of papillomatous tissue remaining. This is not recurrence, but incomplete destruction. Again, if the bladder wall is trabeculated, a sessile papilloma may be of far greater depth between the trabeculations than it is on top of the ridges; and it is between trabeculations that incomplete destruction is most likely to occur. Incomplete destruction is also frequently noticed at the first observation cystoscopy after a transurethral diathermy application. If the technical difficulties have been great, it very often happens that the portion of the growth which faces the cystoscope has been well coagulated, but some portion of the hemisphere furthest away from the cystoscope remains undestroyed.

There is another type of recurrence which is frequently met with. This is contact recurrence. Typically these contact growths are found in two situations: closely surrounding the primary pedunculated growth like seedlings under a tree, and on that part of the bladder wall which is in contact with the primary growth when the viscus is empty. Thus it is specially important to make a complete examination of the bladder wall, and not be content to discover a single papilloma. Where there is one papilloma the possibility always exists that there will be more.

A third type of recurrence is the surgical implant. This is easily recognized by its position. After suprapubic diathermy it is always essential to examine the scar cystoscopically, for it is here that surgical implants occur.

There is one other feature about recurrence that we should like to bring to your notice—the sporadic and late recurrence. At one time we quietly accepted all newgrowth which was not due to incomplete destruction, contact recurrence or surgical implantation, as true recurrence. Now we feel quite positive that in many instances these so-called recurrences bear no direct relation to the original growth. The department has a number of cases of villous papilloma which have been observed over a considerable period of time. In these cases we have been particularly struck with the sporadic nature of the recurrences both in their position on the bladder wall and in time. In certain cases recurrences have occurred in every conceivable situation on the bladder wall.

There is one man in particular who was mentioned before, the miner from Newcastle. In this patient the original growth was in the neighbourhood of his right ureteral orifice. This was destroyed by trans-

urethral methods in one sitting. After one recurrence due to incomplete destruction had been dealt with three months later, no more newgrowth was ever seen at the original site. Since that time, eight years ago, he has had large numbers of recurrences destroyed. He reports every three months, and no recurrence has ever required more than a few seconds for its destruction. We feel sure that this case and other similar cases are due to the condition known as papillomatosis, the true nature of which has been disguised by regular treatment. The condition, in other words, is one of multiple primary lesions rather than recurrences.

It can of course be argued that late recurrence is a feature of malignant disease in general. However, in most cases it occurs in the scar at the site of operation, or sometimes it lies latent in a lymph gland. These conditions do not seem comparable with a second papilloma appearing years after the primary growth, and in such a situation that to all intents and purposes contact recurrence and surgical implantation can be excluded. When a second papilloma appears in these circumstances we believe it is a second primary lesion and not a recurrence. From the point of view of the surgeon these matters are somewhat academic, but carry interest in the true interpretation of the condition.

PROGNOSIS.

The prognosis in bladder newgrowth depends upon a variety of considerations.

The nature of the tumour is important. A single pedunculated papilloma has a better prognosis than when more than one is present. Multiplicity indicates either a special tendency for the tumour cells to form contact recurrences, or perhaps a special lack of immunity on the part of the bladder mucous membrane. Though it is quite possible to keep these cases in check or to achieve clinical cure, the period of close observation is almost certain to be of longer duration than when a single tumour is present. In the sessile or papillo-carcinomatous type the prognosis is quite good so long as the tumour possesses fronds and is not solid. In this type, infiltration, though always present, is not usually a marked feature, and some patients with extremely extensive tumours have done very well indeed, remaining free of recurrence for a considerable time.

Of the solid type of tumour the rare pedunculated kind has a reasonably good prognosis, but in the sessile variety the outlook is not good. The ulcerative variety has a bad prognosis; they are usually too widespread for partial resection, and extension beyond the bladder and gland involvement occur early. Fortunately this is a small group, and the surgeon must be prepared, if he operates, for palliative measures only. It should, however, be stressed that it is extremely difficult, if not impossible, to reach any reliable conclusion at operation regarding the structure of many solid tumours. They may be of any grade of malignancy, and this can be discovered with certainty only by microscopic examination.

The question of size is not so important in prognosis. It is surprising what good results may be obtained by the coagulation of a pedunculated or sessile tumour which is filling the whole bladder. This to a certain extent is self-evident, for it is obvious that a papilloma of this size must have been in existence for years, and if at the end of that time it has filled the bladder without producing contact recurrences, its malignancy must be very low.

Situation is of considerable importance. The prognosis is most favourable when the growth is well away from the ureteral orifices and, more especially, from the bladder neck.

As far as age is concerned, our records tend to show that, unlike certain other forms of cancer, the prognosis is rather better when a villous papilloma occurs in a young man than it is later on in life. Young in his textbook concurs with this view, and on consideration this observation has considerable significance in deciding whether papillomata are malignant from the beginning or acquire malignant characteristics during their lifetime. If all papillomata were malignant from the beginning, one would be justified in assuming that the prognosis in young persons would be worse than the prognosis in middle or old age. An assumption of this kind would simply follow the general rule in most other forms of carcinomata. But the opposite is the case; and in view of this it seems probable that at least some villous papillomata begin life as benign growths, and that their malignant characteristics are acquired. If this hypothesis were correct, the tendency to malignant degeneration would probably increase with the age of the patient.

Apart from these considerations of size, age, position and type, a prognosis should never be given at the initial operation. Some cases which appear in every way favourable, are in reality far more malignant than they seem clinically. It is always wise to defer prognosis until three months after the initial operation, when an observation cystoscopy is performed. If then the growth has completely disappeared, or if there is a small amount of growth which has escaped destruction and can be dealt with transurethrally, or if there are only one or two small contact recurrences, then a favourable prognosis may be given. But if the hæmaturia persists, and on cystoscopic examination it is obvious that the remaining growth is too extensive for transurethral diathermy, then the prognosis must be very guarded. Several patients have done well after two suprapubic operations at an interval of three months, but these are exceptions.

CURE.

It will be noticed that whereas it has been possible to give the number of deaths fairly exactly, no attempt has been made to estimate cure beyond mentioning those patients who survived for five years or longer. We have among the records patients whose condition has been quiescent for as long as thirteen years after the initial operation and who then apparently have developed recurrence. These were unfortunately not followed up systematically, so it is impossible to

say how long the recurrence was present before making its presence known by hæmaturia. If as long as thirteen years can elapse before a recurrence appears, it would seem almost impossible to be certain of absolute cure.

Clinical cure must always vary with the point of view of the individual surgeon. It has been the practice of the department to define clinical cure as follows. If, after an initial operation, or after the destruction of a recurrence, observation cystoscopy shows a clear bladder in three months, again in six months, and again in twelve months, the patient can be regarded as clinically cured; but it is insisted on that he reports thereafter at intervals of twelve months for a minimum total period of five years.

THE GEORGE ADLINGTON SYME ORATION.

THE MASTER SURGEON.

By F. Wood Jones,
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It would seem that in all lands, when the healing art was still in its swaddling clothes, the surgeon was ranked, both professionally and socially, as being far below the dignified status of the physician.

And the reason of this is not far to seek. The physician, as a healer, was one who, if not actually belonging to, was certainly allied to the priestcraft. There was a sanctity, as of the spiritual healer, about the man who, by the laying on of hands, by incantations and spells, or by the use of appropriate drugs, healed the physical ills of mankind.

The physician was a man who attempted to sooth the patient and relieve him of pain. The surgeon was of necessity a man who was often called upon to inflict pain. Moreover, the physician did not cut or maim or in any way desecrate the human body, which, even if it were not necessarily made in God's image, had always a certain sanctity attaching to it.

It is difficult to estimate the influence that this belief in the sanctity of the human body has had in the development of medical science. Probably the belief itself is as old as the crudest conception of immortality; for there is manifested at all periods and in the religious beliefs of all peoples a dislike for destroying the integrity of the corporeal body, lest immortality should entail the continuance of a maimed or incomplete personality. Though we have risen so far superior to this ancient weakness that, judging by current conversation, we have some pride in the extent of the removal of parts of our anatomy, we must not forget that in the earlier phases of the human story there was a pious horror felt in any maiming or mutilation of the body destined to become the outer trappings in which immortality might be achieved.

The craft of the surgeon all too often involved mutilation and, like that of the anatomist and of the maker of mummies in ancient Egypt, it was a craft which, though recognized as necessary, was not ranked as being of a very high order. The stories of the despised embalmers and of the anatomist do not concern us: it is the surgeon, who mutilates the living body, with whom we are concerned.

The emergence of the surgeon was a slow one. He was long in living down his ancient stigma and in attaining a position of eminence or even of fair respectability in the ranks of the medical profession.

Even in China, where the practitioner of the healing art has held high honour since the earliest times, the surgeon took lowly place. The status of the surgeon was very clearly laid down in the famous Chou Rituals promulgated in 1155 B.C. In these rituals the whole ordering of the profession was codified and made a part of social and professional observance. The surgeon was ranked as "a low grade doctor" and above him were placed the physician and the dietician, and below him only the veterinarian.

In Europe the earlier stages of the emergence of the surgeon are well known, and there is no need to dwell upon the long-enduring partnership of the barber and the surgeon. In England the Barber Surgeons were incorporated in 1461 by Edward IV. In Scotland they were not incorporated until 1506. I confess to being one of those who, by reason of a reverence for ancient guilds, and having regard to the state of surgery in Europe at the time, would seek no apology for this ancient alliance. Nevertheless, it is obvious that if surgery was to make any considerable advance either professionally or socially, divorce of the ancient partners must result. The factors that led to this divorce are not always clearly understood, or not clearly stated. The surgeon advanced, both in professional skill and in popular estimation, and so emancipated himself from the partnership of the barber. So much is obvious, but the factors that led to the advancement of the surgeon are not always recognized.

The Barber Surgeons were incorporated in England in 1461. In 1485 Henry VII came to the throne, and the reign of this monarch (1485-1509) may be said to mark the turning point in the history of the English surgeon. Several factors, some of which at first sight appear to have no relation whatever to surgery, conspired together to elevate the art of surgery and to enhance the reputation of the surgeon. In the first place, a great increase in population occurred during this reign and, far more important, what may be termed the first period of industrialization of England was initiated. This was the time of the rise of the guilds. The craftsman and the artisan came into being as an urban class, distinct from the agricultural population scattered throughout the country districts. It was but natural that the accidents and injuries incidental upon even this degree of industrialization should demand the skilled attention of the surgeon as distinct from the barber or the physician. This was probably the first direct incentive to the emergence of the surgeon: and it may be said with truth that every stage in the development of an industrial urban population has initiated some new phase in the development in the art of surgery and in the evolution of the surgeon. But, apart altogether from the accidents and injuries necessarily associated with the specialized industrial development of the population, there were other factors that became of dominant importance in the reign of Henry VII.

Gunpowder was an ancient invention of the Chinese, and it had been adapted to European warfare, in the form of crude mortars,

more than a century before Henry VII came to the throne. Strangely enough, tradition credits this barbarity to a priest—Berthold Schwartz, a German monk of Cologne—who is said to have invented mortars to be used in warfare some time about 1331. These engines were used at the siege of Algeciras in 1346 and by the Venetians in 1380.

But firearms, in the form of cannon or muskets, did not come into common usage until a later date. The musket was employed as an offensive weapon in warfare only at the close of Henry VII's reign. Even Ambroise Paré, who did so much to bring about a rational treatment of gunshot wounds, wrote also of the wounds made by arrows and darts so late at 1579. But more than thirty years before that he had published his great treatise on the treatment of wounds made by the hacquebutes and other firearms. The musket came into regular use in warfare in 1521; but at the close of the reign of Henry VII the employment of firearms in warfare had already made a demand upon the medical profession that only the skilled military surgeon could cope with. It was the "Canons, Bastards, Musquits, field pieces, Culverines, Serpentines, Basilisques, Sackers, Falcons, Falconets, and divers others" that wrought the havoc with humanity that only the specialized surgeon could hope to repair. In the wake of armies came another scourge that created a new field for the physician and surgeon alike. In 1495, when the armies of Charles VIII were before Naples, a new disease broke out, and during the reign of Henry VII of England syphilis had spread all over Europe and to England. Many of the manifestations of this disease, which had not yet come under medical control, were to be treated only by the surgeon. It is probably true to say that two of the greatest scourges of mankind—the use of firearms in warfare and the frightful ravages of syphilis—gave, in the reign of Henry VII, the master surgeon his real charter and his professional distinction.

The dawning years of the sixteenth century were fatal for humanity in Europe. There were great social changes: the guilds took their rise and an artisan class, leading urban lives, came into being. The sumptuary laws indicated the new distribution of wealth. There were wars innumerable, and war was now made horrible by the introduction of firearms; and following the armies came the curse of syphilis. In 1512 the surgeons were incorporated. The master surgeon came into being, a respected and distinguished member of society; and, as was but natural, the earlier master surgeons, who established the dignity of their craft, were the followers of armies. It is Ambroise Paré (1517-1590) who may be taken as their great prototype. Paré followed the armies of five French monarchs (Francois I, Henri II, Francois II, Charles IX, and Henri III). Thomas Gibson was attached to the army of Cromwell. John Hunter learned of gunshot wounds whilst serving with the expedition to Belle Isle. Baron Larrey, who was present at sixty battles and four hundred engagements, was Surgeon-in-Chief to the Grand Army of Napoleon, and, like Charles Bell, he attended the wounded after Waterloo.

These are a few of the master surgeons who learned much of their craft on the field of battle, whose names come readily to the mind when the three centuries from 1550 to 1850 are passed in review.

It was this passage of three hundred years that saw the emergence and the rise to fame of the master surgeons. In 1745 George II granted a charter to the Corporation of Surgeons and the status of the surgeon was established. But I fancy that it is true to say that, at the end of this period, the fame of the master surgeon began to decline: and this statement obviously stands in need of justification. It would be manifestly absurd to claim that in the interval between 1550 to 1850 the greatest triumphs of surgery were achieved. Doubtless in some ways the modern surgeon is justified in regarding the surgery of this period as belonging to the dark ages in the story of his craft. But I think few would be prepared to deny that, even if it were not the period during which surgery attained its greatest heights, it was at least the period that produced the greatest master surgeons. And with the phrase "great master surgeons" there comes instantly to the mind a very definite picture of a striking personality: an individual as distinct and as clear cut as is a child's mental picture of a princess or of a policeman. This picture may, I think, be reconstructed, for, without entering on the minutiæ of biography, the thought must intrude itself upon anyone who is familiar with the lives of the great surgeons, that they were, perhaps more than any other set of men united through time and space only by the bond of a common profession, strangely cast in a common mould. It would be a difficult task, or even an impossibility, to draw a composite portrait of, say, the great ecclesiast as he was manifested in the flesh in the various countries of Europe over a period of three centuries. But with the surgeon the business is not even a matter of great difficulty, for there is so much that is common to them all that almost inevitably, in reading the life of any one of them, there comes the thought that, but for time and circumstance, the picture is that of any other of our great masters. When we read of John Hunter's habit of early rising and of his dissections performed before breakfast, we may find, not similarity but actual identity in the recorded doings of Astley Cooper and Charles Bell. When Paré tells us of his solicitude for wounded solders, we recall similar passages in the letters of Charles Bell and in the writings of Larrey. When the magnificence of Cheselden as a personage is considered, there come to mind the pictures of many of the master surgeons of our period. And when the humanity, the dexterity and, above all, the indomitable energy of any one is considered, all are in similar case. In the enormous capacity for work, in the real striving for professional ideals, and in the whole-hearted desire to assist suffering humanity, all, from Ambroise Paré (1517-1590) to James Syme of Edinburgh (1799-1870) and George Syme of Melbourne, are akin.

In reviewing the lives of the great surgeons who flourished between 1550 and 1850 it is difficult to avoid the justly despised attitude of the

laudator tempores acti and to declare that there were, indeed, giants in those days.

Details may be fitted into the broad outline of the portrait of a great surgeon of our period. First, and by reason of professional bias, I would recall the fact that all the great surgeons were great anatomists. Ambroise Paré, when not engaged in his merciful duties upon the field of battle, returned to Paris and, under the great Sylvius, made himself familiar with the structure of the human body. In 1550 he published his only work on academic anatomy, but for the whole of his long life he prosecuted his anatomical studies whenever opportunity made them possible. Thomas Gibson, although he was the busy Surgeon-in-Chief to Cromwell (whose daughter he married), is known most widely as the author of an excellent textbook in anatomy that was issued in no less than six editions between 1682 and 1703. Of John Hunter's labours and discoveries in anatomy there is no need to tell. Had John Hunter achieved no more than his mastery in anatomy he would have been famous for all time, for no man inherited the spirit of Vesalius more surely than he. William Cheselden was a master in anatomy and, during his busy and remarkably successful life as a surgeon, he published anatomical works upon a scale of magnificence hardly met with either before or since. It was his zeal for anatomy that brought him into conflict with the Corporation of Surgeons, and his textbook—which superseded that of Thomas Gibson—appeared in thirteen editions, from 1713 to 1792. Of Astley Cooper, his biographer tells us that "his labours in the dissecting room were incessant", and, like John Hunter, he was wont to dissect before breakfast. He was an ardent anatomist long after wealth, professional distinction and social eminence were his in overwhelming measure. It was his zeal for making anatomical preparations that led to the historic birth pains of the Borough School of Guy's Hospital from its mother in Westminster. Charles Bell, like Astley Cooper and Hunter, was at work between six and seven in the morning making anatomical preparations long after fame and fortune had come to him. Like them also, his name is indelibly associated with the structure of the human body, and there must be many of us who regret that the introduction of an alien terminology is tending to relegate the names of the great surgeon anatomists into the background. If the names of the Bells—John and Charles—had not been firmly enthroned in the annals of surgery, the human anatomist would always revere their memory. And so with Chopart and Dupuytren and a host of others of our period who were master surgeons and master anatomists as well. Of all these men we may say with truth that they had this common attribute: they were ardent students of anatomy throughout their lives; they were students of anatomy long after professional success, wealth and social distinction had come to them. They did not learn their anatomy as medical students and then become practitioners of surgery; they were life-long dissectors and operators on the cadaver. Nowadays we talk with some pride of post-graduate studies. To these men pre-graduate and post-graduate days were all

one. So long as they practised surgery they were practical students of anatomy. In their day this was an essential condition of practice; and in truth anatomy may well be a life-long study for any man who would have the hardihood to tamper with the structure of the human body.

The next common attribute that we need dwell upon in constructing a composite picture of the master surgeon is his great humanity, his pity and his dislike for performing operations that, however reluctantly, have been accepted as inevitable. Paré, though in some respects a somewhat full-blooded old ruffian, startles us again and again with his intense pity for the wounded man, his dislike for inflicting pain, and his almost womanly solicitude for the stricken soldiers under his care. A dozen extracts from the works of Paré could be quoted to this end. "I could not sleep all that night; for I was troubled in mind. Therefore I rose early in the morning and visited my patients." "I left them [the operations of the ancients] because they are too cruell, and am willing to follow the moderns who have moderated such cruelty." "We heard them cry under our horses' feet, which made my heart relent to hear them." His great humanity is revealed when he tells of the old soldier cutting the throats of three of his comrades and of the wounded man who was to have been buried and of whom he took charge, "moved with pitie", and after having been physician, apothecary, chirurgeon and cook to him during a difficult campaign, saw him ultimately "cured by God". These were the expressions of a man whose life was spent in a series of campaigns and whose feelings might easily have been dulled by the dreadful barbarity of his times and by the almost constant familiarity with scenes of carnage. The letters of Charles Bell to his brother George are full of passages that tell us very vividly of his compassion for the sufferer and his dislike for inflicting pain, either by necessary operation upon the human subject or upon animals in order to gain knowledge. In 1809 he went to Haslar to see the wounded from Corunna, and found his visits "singularly affecting". His description of the wounded at Waterloo contains many passages of the same kind. To his wife he writes (1818): "I have just been performing a serious operation, and that, as you know, is always severe upon me." And to his brother (1823): "I have an anxious operation on my spirits tonight." And later: "I have had a most miserable time since I wrote to you, from the failure of an operation, and the death of a most worthy man. I shall regret it as long as I live. It is very hard, more trying than anything that any other profession can bring a man to." In the next year (1824) he writes to his brother: "I must do an operation tomorrow, which makes me today quite miserable." And later: "I had operations both at hospital and in private, from which I suffer indescribable anxiety."

Charles Bell could never quite convince himself that he was justified in inflicting pain upon animals even when his experiments were designed to alleviate human suffering. "You may think me silly", he writes to his brother (1822), "but I cannot perfectly convince myself that I am

authorized in nature, or religion, to do these cruelties—for what?—for anything else than a little egotism or self-aggrandizement: and yet what are my experiments in comparison with those which are daily done? and are done daily for nothing."

In this connexion it is worth recalling that John Reid, who died in 1849, suffered with enormous fortitude the repeated operations for the alleviation of the pain caused by carcinoma of the tongue, because he fancied that in some way he was making amends for the pain he had inflicted on animals in the course of his studies.

It was the same with Astley Cooper, with Cheselden and Syme and all the others. The master surgeons were great humanitarians who operated only when they regarded it as absolutely imperative and then acted with a feeling of intense pity for the suffering person who was to undergo the ordeal. It must be remembered that Astley Cooper, in the days before anæsthetics and antiseptics, did not hesitate to ligature the aorta in a desperate endeavour to save a man's life. Skilful though they were and dexterous to a remarkable degree, the master surgeons regarded operation only as a last resort and as a measure to be undertaken only after—almost literal—prayer and fasting. They operated in last resort with only one object in view—the saving of the life or the restoration to health of a patient in desperate case.

Their dexterity we may pass over, since all may agree that despite the great surgical advances that have taken place since 1850, the skill of the master surgeons who flourished before that date has never been surpassed, even if it has ever been nearly approached.

I would make bold to say that no modern surgeon could equal the dexterity and the celerity of the master surgeons in performing many of the major amputations. Larrey is reported to have performed two hundred amputations in one day, and we know well from the testimony of eye witnesses and even of patients themselves, the astonishing and almost painless speed with which a major operation could be performed by the great surgeon of the pre-anæsthetic era. Cheselden is reported to have removed five stones from the bladder of Baron Carlsum in two minutes and four seconds, and many other records exist of the marvellous manual skill and the complete knowledge of anatomy that was possessed by the master surgeons.

One other factor we must take into consideration in depicting the character of a master surgeon, and this is an inordinate capacity for work. To read the lives of any of these men is to come to the belief that they were incapable of fatigue. John Hunter's daily round of work leaves us gasping: his energy was unbounded. To a prospective pupil he said: "Come to me tomorrow morning, young gentleman; come early in the morning, as soon after four as you can." And it is recorded that when the young gentleman (Mr. Thomas) presented himself at that hour, he found John Hunter engaged in dissecting beetles. Astley Cooper, like John Hunter, was a very early riser. He started the day with his dissections and visited patients before breakfast. He saw patients at his house till 1 o'clock: then went to the hospital to perform

operations and give lectures. He visited patients in their homes until seven, and then had a frugal dinner and a few minutes' repose, and afterwards saw patients and delivered lectures till midnight.

Charles Bell has recorded a day's work in a letter to his brother in 1807: "Rose before 5 o'clock, leaped the garden wall and ran in full chase through the country, making acquaintance with every living thing I met—have written a quire of papers and notes—enjoyed a ride of thirty miles into the country, with a sense of enjoyment heightened by long confinement—I went to perform an operation." And all this when he was on holiday. Few men could now emulate the boundless energy with which these master surgeons carried on their work, or get into the day the routine that was theirs throughout the whole of their professional lives.

And this brings in its train the corollary that the master surgeons were all great men. They were the elect; built upon big lines and most of them were as well equipped physically as they were mentally. All were men of fine and outstanding personality. Dupuytren, the so-called Napoleon of surgery, was stolen as a child because of his eminent beauty: Bell, Astley Cooper and, above all, Cheselden were magnificent figures in their day—they were fine big men and far above the average as specimens of comely manhood.

Moreover, they were all inclined towards living large and open handed lives. John Hunter we all know supported a household of over fifty persons not counting his numerous pupils. It was to Lynn that he said: "I must go and earn that damned guinea, or I shall be sure to want it tomorrow." Cheselden kept open house and lived magnificently. Charles Bell, when only thirty-three, wrote: "I can only study when my pockets are full, which I conceive to be a demonstration that I was intended for a gentleman." Astley Cooper had an income, a century and a half ago, of over £20,000 a year—and lived up to it. There was nothing small about the master surgeons. They were outstanding men in personality and attainments. They lived great lives. They were the elect; and great knowledge and skill and energy went to the making of them all. And the truth is that no second-rate man could be a successful surgeon in the period from 1550 to 1850. Surgery was a profession for men who were great in every sense of the word. Men of great knowledge, great judgement and great humanity: men of fine physique, fine character and built upon large lines: these were the master surgeons in the days before inhalation anæsthesia and antiseptics.

And above all this, there runs through the lives of the master surgeons a curious thread of religious feeling difficult at times to define, since the expression of piety is apt to be strangely blended with the evidences of a very robust and self-reliant personality. Paré is well known by the expression: "I dressed him: God healed him"; but at times (as when speaking of the Marquess of Auret) he gives vent to a deeper piety: "Having seen him", he writes, "I went a-walking in a garden where I prayed to God that He would give me grace to cure him

and that He would give a blessing to our hands." On January 12, 1852, John Flint South recorded in his diary that he had been called to the hospital to perform an operation for strangulated hernia, and he says: "Though I did not enjoy the job, prayed for help and had it, though the case was an awkward one." Side by side with this we may range Charles Bell's account of his first visit to St. Paul's Cathedral in 1807 and many another passage in the writings of the master surgeons.

But with all the similarities there come contradictions, and no one could picture John Hunter as the author of the letter which William Hey wrote to one of his friends. "Dear sir", he wrote, "I hope you will excuse me for mentioning to you, that, in the conversation which we had this morning, on an important political subject, you repeatedly used the sacred name of the Almighty as a mere expletive. And allow me to submit to your consideration, whether such a use of that name is not forbidden by the Third Commandment. I am, yours respectfully, William Hey."

Few of the master surgeons could have written that letter. William Hey may have carried his piety somewhat openly among his fellows, and John Hunter may have been at some pains to conceal his; but running through the lives of all these men there is a thread of feeling that manifests itself at times in formal religion and at times in a deep reverence and a sincere, if not always orthodox, religious sentiment.

Such were the master surgeons. Men cast in a large mould: men of splendid physique: fine handsome men who lived their lives on a grand scale and who accomplished the fullness of their lives by reason of a boundless energy. There is indeed much truth in the old Italian proverb which says that "the good surgeon must have the eye of an eagle, the heart of a lion and the hand of a woman". And such in truth were the master surgeons.

The attributes that characterized the master surgeons belonged to but few men, and though from 1550 to 1850 we may find the records of many operators—many who cut for stone and who performed amputations—the names of the great surgeons are but few. And the truth is that in the days before the introduction of inhalation anæsthesia (and later, of antisepsis and asepsis) the great surgeon must needs be a man of very outstanding qualities before he could justly claim much distinction from the mere blood-letter and the employer of the cautery and the seton.

When the question of the lulling of consciousness or the ablation of pain during surgical operations is discussed, it is almost inevitable that the word "anæsthesia"—coined by Oliver Wendell Holmes for the use of William Morton, the American dentist, in 1846—comes to the mind. And in this way all discussions of the subject are apt to take shape about the rivalry of the several claimants to the distinction of having introduced some drug or other that was administered by inhalation.

Inhalation anæsthesia is only one method of achieving the desired result and, since the beginning of the twentieth century, it has ceased

to be the sole agent for permitting operations to be performed without the infliction of pain. And here history repeats itself. Long before inhalation anæsthesia was known, the surgeon found means to dull the pain produced by the knife or the cautery. It is a well attested fact that Hua T'o, the great Chinese surgeon, who was born in the first century after Christ, performed major operations (such as the removal of the spleen *et cetera*) upon patients to whom he had administered a drug that produced insensibility. Part of the fame of that fabled plant, the mandrake, rests upon the fact that it was the first anæsthetic discovered by man. Its properties have been known for over three thousand years, but only comparatively recently has it been shown that it contains hyoscine, hyoscyamine and scopolamine, as well as other soporific alkaloids. In ancient medicine mandragora was used to produce deep sleep and complete insensibility; and in addition to this fabulous plant, datura, *Cannabis indica*, jasmine, aconite and rhododendron were all employed before the juice of the poppy was revered for its dulling effect on pain. In Europe, before the discovery of inhalation anæsthesia and after the heyday of the mandrake was passed, opium and alcohol were in common use for alleviating the pain of the surgeon's knife. We know that alcohol was commonly administered to the wounded in battle, either upon land or sea; and opium has long been known for its merciful action in deadening the pain of the wounded.

But in the descriptions of the operations performed by the master surgeons there is singularly little information as to the treatment of the patient before he was brought to the ordeal of the operating table. When Sir Astley Cooper performed his heroic ligature of the aorta, it is recorded that the condition of the patient during and after the operation was "awful", and that opium and camphor were administered to him. Larrey, when on winter campaigns, noticed that cold greatly diminished the sensibility to wounds, and suggested the production of low temperatures as a form of local anæsthesia.

But despite the employment of opium, alcohol and cold, it would seem that, during the period of the master surgeons, no anæsthetic comparable to the ancient mandragora was in general use. At any rate, we know that during the period before the introduction of inhalation anæsthesia the surgeon had to operate with extraordinary precision and with a maximum of speed and dexterity upon a patient who was conscious of the proceedings, who was capable of expressing his feelings, and who was usually actively struggling with the many assistants required for his necessary restraint.

It is one thing to operate upon a passive and insensate body. It is an entirely different thing to operate upon a sensitive, shrinking and struggling human being keenly alive to every stroke of the knife and to every stage of the whole manipulative procedure.

In the one case, though skill is necessary, there is no demand for that fine combination of dexterity, certainty and celerity that is essential in the other. Many a man, who might have become an eminent

surgeon in the days of inhalation anæsthesia, quailed before the ordeal of operating in the pre-anæsthetic period.

With the introduction of inhalation anæsthesia, surgical operations became far more frequent and far more extensive. Surgical operators also became so numerous that, instead of one or two men standing out as master surgeons during any given period, there is a host of operators distinguished mainly by some specialization in surgery. Great names all of them and worthy of remembrance, but, maybe, not of the calibre of the master surgeons of the pre-anæsthetic period. It may be said that the history of surgery from 1550 to 1850 is written in the life stories of a few great men, and that after 1850 it may be recorded in terms of advances in technical details. The one is a period measured in the lives of the master surgeons; the other a time marked by technical and manipulative perfections of operative procedures.

But though full anæsthesia had been achieved by inhalation methods at the end of our period, and though operations could be conducted with far less manual skill and far less rapidity than in the period of the master surgeons, operative measures were still undertaken at a frightful risk. The mortality was so high that no mere amateur would venture to try his hand at the business. It was not because the operation, undertaken at leisure upon a passive and insensible patient, failed to achieve its end, but that the operation, possibly successful in its purpose, was so commonly followed by sepsis. When full inhalation anæsthesia had made the way easy for the man who was something less than master surgeon to tamper with the human body, the dread of sepsis was always present to stay his hand.

It required the work of Tyndall in 1870 and that of Pasteur before Lister could enunciate his thesis of antisepsis.

These things are within living memory. Roswell Park has left it on record that "in 1876 as a hospital interne, in one of the largest hospitals in this country [America], it happened that during my first winter's experience—with but one or two exceptions—every patient operated on in that hospital, and that by men who were esteemed the peers of anyone in their day, died of blood-poisoning, while I myself nearly perished from the same disease." Such was the sad experience of all men who served their apprenticeship between the days of anæsthesia and antisepsis. There is no need to dwell upon this phase of surgery. We all know of the revolution that was brought about by the introduction of Lister's methods of antisepsis and by the later adoption of asepsis. We live in a transition period, for happily there are those among us who bridge the gap and still remember the difficult days when Lister was converting the surgeon to his methods.

And now we have arrived at the day of complete anæsthesia and of perfected aseptic methods of operation.

The demand for great and precise anatomical knowledge seems to have waned, for there is no longer a need for great rapidity in operation. The patient is inert and unconscious, and time is no great factor in the operation. An operator of today may muddle along in safety, when

a master surgeon of our period would have to make seconds and precision do for what, today, hours and hesitancy will suffice for.

Moreover, such things as the body cavities, the joints, and even the brain itself are, with Lister's blessing, open to the merest meddler who has a leaning towards surgical procedures.

Today the business is so safe that any person possessing a registrable medical qualification is free to tamper with the human body. The blessings of anæsthesia and antisepsis have made this possible. Almost it might seem that the master surgeon had ceased to exist or had lost his identity in the multitude of operators. But the passing of the master surgeon is only apparent. Today it is not only the blood-letter and the employer of the seton and cautery who crowd upon his heels, for he must rise supreme above a vast company of his fellows who are prepared to undertake, with a light heart, operations that before the days of anæsthesia and asepsis only the elect would have performed.

In less than a century these two things have had place in surgical practice. The operation itself has been rendered painless and, in so far as sepsis was the greatest threat to recovery, it has been rendered comparatively safe.

That, by virtue of anæsthesia and asepsis, operative measures have been rendered painless and comparatively safe is an axiomatic statement and constitutes a well justified boast of modern surgery. But it can by no means be dismissed as a simple statement of fact. There is an inevitable duality of significance in this dictum. Both factors—the freedom from pain and the comparative safety—have their importance both for the patient and for the operator.

From the point of view of the patient we may say that a modern operation, painless in its procedure and entailing but little risk to life, demands but little fortitude from the person who would care to undergo the ordeal.

Pain has, perhaps, been unduly lauded as a spiritual and æsthetic factor in Nature's economy; but I fancy that it is justifiable to suppose that the dread of pain had, in the pre-anæsthetic days, a very salutary effect upon the patient who was not desperately in need of surgical operation. No man or woman would care to become interesting as the subject of operation when fully and consciously aware of every stroke of the knife. Moreover, the ever-present fear of a lingering death from blood poisoning, even when the operation had been successfully completed, insured that none save those in very real need ever occupied the operating table.

In the days of the master surgeons the patient was so desperately in need of surgical skill that he was prepared to face the dreadful ordeal—an ordeal made possible only by his dire straits and by the supreme skill and remarkable dispatch of the operator.

Today all this is passed. There are new conditions and new factors that demand consideration from the surgical profession. Modern life,

with all its restlessness and exactions, finds many who are not prepared to face all the demands of an environment, which, on occasion, is too complex for their proper adjustment. Human psychology (as something distinct from much of the modern outpouring of psychological literature) is insufficiently taught in medical schools, but every medical man of any experience is of necessity something of a human psychologist. As such he knows well that, just as alcohol, drugs, and nervous breakdowns are escapes from hard reality for some people, so are the development of symptoms, which apparently demand surgical treatment, for others. The medical man is faced now, not only with patients in such straits that nothing but desperate surgery will suffice for their relief, but by people who, maybe confronted by some psychological crisis, find an escape in the development of symptoms which may appear to need surgical relief. For such a one, a painless operation, an easy recovery in the quiet of a nursing home or of a hospital, a freedom from worldly responsibilities and with the added interest and pity bestowed by others upon the invalid, are most desirable objectives. It cannot be denied that today many come to operation for purely psychological reasons, who, during the period of the master surgeons, would have shrunk from any such ordeal.

Now this question must be faced from two aspects. It is an undeniable gain that with the lessened fear of operation many present themselves for examination today when their condition holds out some hope of ultimate recovery; whereas, in the old days, they would have come to the surgeon only in a desperate case and when possibly no real cure could be attained even by the most heroic measures. That is, beyond doubt, an enormous advance. But we must balance against this the many who come with symptoms that seemingly demand surgical intervention when, as a matter of fact, nothing more than good advice, based upon an understanding of human psychology, is needed.

And here we come to the other side of the picture. Is there just a possibility that the general practitioner or the specialist—comparatively untrained as they must of necessity be in human psychology—will perform safe, but entirely unnecessary, operations upon some of these people? Is there a possibility that though the operation may be skilfully performed, it may have been quite unjustified and may pave the way to the ultimate invalidism of the patient? I leave these questions unanswered; since their answer can be given only by those who have definite experience of these things. But the subject cannot be dismissed so lightly even by one having only academic experience. Operations are now so easy and so comparatively safe that any duly registered medical practitioner may undertake them. It is undoubtedly a great gain that anyone who lives in any considerable centre of population should have, within easy reach, several practitioners who, on the emergency, could operate with some degree of skill. This is a modern development born of the blessings of anæsthesia and asepsis, and it is, as we must all acknowledge, an inestimable gift of modern

surgical advance. But again there comes a question. It is an indubitable gain that medical practitioners up and down the country should be able to operate on the emergency and so save life or limb; but is it wholly desirable that any man should undertake major operations, which are not in any sense emergencies, in the absence of the experience and the skill that can be attained only by those who have devoted their lives to surgery?

It is possible that, were we able to look back to the present day from the vantage point of a century or so hence, we might note that these years through which we are passing mark a period of transition in the history of surgery. It seems to one who has had some considerable experience in the training of medical students that, from our present position, development might take place in either of two main directions. We might have it as our ideal that every medical student who passes through our hands should go out into the world prepared to, and expecting to, perform major operations upon all those whom he deems to stand in need of surgical treatment. Or alternatively that we should strive to give every student so good a general medical education that, knowing the great principles of his craft, he would go far towards understanding the nature and the needs of those seeking his help. But, save in emergency, he would not undertake to satisfy these needs when they entailed the performance of a major operation. This form of treatment he would delegate to others. And if this last be the road that we should follow (as I sincerely hope it may be), it behoves us to do all in our power to foster the special training of those who, having the necessary attributes, elect to devote their lives to the specialized practice of surgery.

Not every man may become a master surgeon even in these days of surgical advance; but the type of the master surgeon still remains with us, and it is for us to see that the man of this type may become perfected in his craft and take his proper place among us. Towards attaining this end much has been achieved this day in Australia; and it is greatly to be hoped that a new phase of surgical history is here initiated—a phase in which the master surgeon will again stand out in all the great, clear-cut and splendid lines that characterized his forbears a hundred years ago.

SARCOMA OF PERIPHERAL NERVES.

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SARCOMATOUS tumours arising from peripheral nerve trunks or their smaller branches are not so rare as once thought, and they present problems of considerable pathological and clinical interest.

They have been recognized for a long time, and discussion of their nature and behaviour has occupied part of a great number of contributions on lesions of nerves in general. As in many other sections of oncology, however, difficulties have arisen not only with regard to nomenclature, but also as regards their histogenesis. In addition, misconceptions on the part of surgeons in general with regard to treatment and prognosis seem to have crept into practice. I have recently encountered several of these interesting tumours, and this has focused my attention on them and led to the review of the subject which is here presented.

HISTORICAL.

As long ago as 1829 Wood[1] described tumours derived from nerves under the name neuroma and with him lies the credit for recognizing the neurogenic nature of the small painful subcutaneous nodules which often have his name associated with them. Sir Charles Bell[2] removed a tumour from the external popliteal nerve in 1814; the specimen is still preserved in the museum of the Royal College of Surgeons of Edinburgh. There are numerous other early monographs on neuroma, such as those of Percy (1818), Aronsohn (1822), Knoblach (1843), and a famous treatise by Smith of Dublin[3] in 1849. It is strange that none of these observers seem to have encountered pure sarcomata of nerves. Virchow in 1863 placed the pathology of the neuromata on a proper basis, emphasizing as he did the distinction between the true and false varieties.

Von Recklinghausen[4] in 1882 fully investigated the disease associated with multiple neurofibromatosis which goes by his name. Since that time there have been numerous contributions to the literature, particularly in Germany, on all aspects of these neoplasms. In 1900 Thomson[5] wrote his classical monograph on neuromata and neurofibromata—a widely quoted work in which the subject is dealt with mainly from the clinical aspect. Numerous attempts have been made, with varying success, to elucidate their histogenesis and to classify all these neurogenic tumours. Verocay[6] first put forward the view that

the Schwann cell was the origin of many of them, and he has been followed by many pathologists, particularly by Masson,[7] who has become the most enthusiastic protagonist of this point of view. Mallory[8] and Penfield,[9] however, maintain the origin of practically all peripheral neurogenic neoplasms is from the mesodermal connective tissue elements. This controversy is still being carried on, and modern pathological literature contains many contributions to it. In many of these papers, although the existence of sarcoma of neurogenic origin is referred to, its importance has been overshadowed by the doctrinal arguments of one or other school. The most authoritative paper on the subject is that by Stewart and Copeland.[10] This comprises a study of 43 cases, all of which they include under the heading of neurogenic sarcoma, with a very complete review of cases recorded in the literature, and the reader is referred to their paper for a complete bibliography. In this paper I propose to confine my observations to cases of undoubted neurogenic sarcoma of peripheral nerve trunks, referring, however, to some points of interest with regard to their histogenesis and their relationship with other neurogenic tumours.

CLINICO-PATHOLOGICAL TYPES OF NEUROGENIC SARCOMA.

Several groups of these interesting tumours have been differentiated, and they may, for the purposes of this paper, be divided into the following:

1. *Solitary Neurogenic Sarcoma.*—All the cases, with the exception of Case IV, described below, apparently fall into this group. The subjects show no other demonstrable tumours of nerves and none of the stigmata of von Recklinghausen's disease, although it must be recognized that these may be readily missed and should be looked for in all cases. This type occurs most commonly in the sciatic, the median, ulnar and the cords of the brachial plexus. In these, one sometimes finds, as in the interesting cases recorded by Krause[11] and Adair,[12] sarcomatous growths occurring or recurring in different portions of the same nerve trunk, sometimes extending from the periphery to the plexus concerned. This occurrence formed the basis for Krause's suggestion that at operation care should be taken to expose the nerve trunk well above and below the tumour. This group corresponds to the primary malignant neuroma described by Thomson.

2. *Neurogenic Sarcoma Occurring in Patients Suffering from Neurofibroma or von Recklinghausen's Disease.*—This group corresponds to the secondary malignant neuroma of Garré,[13] Thomson and other writers, and seems to be relatively common, although only one of the cases recorded below can be with certainty so classified. Complete knowledge as to the exact scope of von Recklinghausen's disease is lacking. Although this syndrome, as originally described, included only those cases showing multiple soft cutaneous neurofibroma with areas of brown pigmentation, the modern tendency seems to regard cases showing multiple neurofibroma of nerve trunks, plexiform neuroma, *elephantiasis*

neuromatosa and ganglionic neuromata as included in the von Recklinghausen syndrome and essentially manifestations of the same process. Whether or not this is entirely justifiable is still doubtful, but so many transitional cases and cases showing every possible combination of pigmentation, cutaneous and deep neurofibromata have now been described that it seems to be. Some regard the patchy pigmentation as simply a *forme fruste* of the malady and there is histological evidence of a neurogenic basis for this too, which of course has not been overlooked by Masson when searching for support for his views as to the neurogenic nature of melanoma of the skin. There seems to be little doubt that more and more of these lesions are being proved to be essentially similar in their histogenesis. It has been for long recognized that one or more of these apparently innocent neurofibromatous tumours may, after being present for many years, undergo malignant change and become true sarcoma. Although it is probable that the frequency of this change has been somewhat exaggerated, it is a well established clinical fact, and Stewart and Copeland in their series of 43 cases found 12 cases which could be classed in this group, while Thomson from a study of cases collected from the literature stated that this change occurred in 17%. It is also of interest to note that in some cases melanomata have developed in the skin of patients suffering from multiple neurofibromatous tumours.

If there is only patchy pigmentation, the sarcoma is usually single; in others with multiple tumours as a rule only one takes on the malignant change, and this not infrequently after surgical operation. It must also be borne in mind that sometimes cure of one tumour is followed by the appearance of sarcoma in another area. In other cases the sarcoma occurs in a plexiform neuroma in which one nerve or fibre of one nerve is alone affected, although this type may be associated in some degree with other stigmata of von Recklinghausen's disease. Some support is lent to the idea that these cases have a familial or hereditary basis by the fact that various types of congenital abnormalities are often found in these patients. These tumours are histologically and apparently histogenetically identical with the primary type, differing only in the fact that they are rarely of the most malignant grade and that pulmonary metastases seem to be much less common than in the primary type.

3. *Neurogenic Sarcoma in Other Tissues.*—Following the decision of Masson[7] and others that many of the so-called fibrosarcomata of the skin and subcutaneous tissues—Paget's recurring fibroid, for example—are neurogenic in origin (and much evidence has been brought forward in favour of this view) many pathologists now believe that most of the sarcomatous tumours founds in relationship with the fascia, muscle or periosteum of the limbs come into this category. For long we have taken for granted the origin of these tumours from the connective tissue of these regions, and it is probable that their neurogenic origin has been overlooked. Stewart and Copeland include some of this group in their survey, while Ewing[14] strongly supports this conception of their

histogenesis. Histologically they conform closely with the two groups under discussion, sometimes show pigmentation which suggests an affinity to the melanomata and show a striking predilection for such sites as the scalp, the interscapular area, the popliteal fossa, the buttocks and the groin. As their histogenesis is not quite proven, however, they are excluded from this study.

CASE HISTORIES.

The following case histories illustrate most of the clinical features of these tumours.

Case I.—Neurogenic Sarcoma of the Sciatic Nerve.

O.P., a male, aged thirty-six years, by occupation a farmer, was admitted to hospital on November 10, 1933, complaining of pain of a neuralgic nature in the big toe and ankle of the right foot. The pain had been noticed for twelve months and had gradually extended to the knee. Four months after the onset of the pain a swelling was noticed in the lower third of the posterior aspect of the right thigh. This swelling was not tender or painful, but when knocked pain radiated to the big toe. This pain was at times quite severe. The swelling gradually increased in size, and growth appeared to have been more rapid during the month preceding admission to hospital. During the last few weeks he had noticed that he tended to drag the foot when walking.

On examination, he was found to be a healthy man, all the general systems being normal. In the dorsal region of the right thigh a large tumour, "as large as an orange", was easily detected. It was freely mobile from side to side, but not along the long axis of the limb. It was not particularly tender, though pressure on it caused pain to shoot down the leg. It was hard and rounded, obviously not cystic and showed no adhesions to the surrounding structures. He had foot drop on the affected side from paresis of the anterior tibial muscles and sensation was impaired, though not completely lost, over the inner side of the sole of the foot and the big toe. A complete examination of the various types of sensation over this area was not carried out.

The diagnosis of sarcoma of low grade, pressing on the lateral division of the sciatic nerve, was made, and operation was advised.

On November 20, 1933, the tumour was exposed through a posteriorly placed incision, the medial division of the sciatic nerve was easily freed, and the tumour, which invaded the lateral division, was removed after complete section of the nerve above and below. There seemed to be some separation of the nerve fibres above the tumour when the section was performed.

The patient made an uninterrupted recovery, with paralysis of the muscles supplied by the external popliteal nerve. He was fitted with an uplifting toe spring before discharge from hospital. On January 2, 1934, he commenced an intensive course of deep X ray therapy to the area from which the tumour had been removed.

He was reexamined on October 30, 1934, when he was found to be in perfect health, able to carry out a hard day's work and to have no sign of any recurrence.

Reexamination on November 25, 1934, revealed no demonstrable trace of recurrence in the operation area; the patient was walking very well, and maintained that he had never felt better.

The pathological report was malignant schwannoma of relatively low-grade malignancy.

This tumour shows many giant cells, is very cellular and in places presents typical areas with poorly supported blood vessels. Recurrence is extremely probable, and death from pulmonary metastases is very likely to occur.

Case II.—Neurogenic Sarcoma of Inner Cord of Brachial Plexus.

A.B., a male, aged eighteen years, was admitted to hospital on February 12, 1934, with a history that for the past two years his right arm became tired when he carried anything or put his coat on. Four months later he noticed a tingling feeling in the right hand, which was treated by rest. A little later he noticed that his hand was clumsy and weak, so that he used to drop things. This disability gradually increased until at the time of admission to hospital his hand was somewhat palmar flexed and more or less useless. Pain in the hand and forearm, particularly along the ulnar side, had also developed, and at times was neuralgic in nature, often preventing him from sleeping. On examination, he was found to have an ulnar paralysis, and some loss of sensation to pin prick along the ulnar border of the hand. There was no weakness of the flexors or extensors of the elbow, and the tentative diagnosis of cervical rib was made. This was confirmed by radiography, the report being "long and pointed transverse process to the seventh cervical vertebra probably carrying a cartilaginous extension". At this time, palpation just above and below the clavicle caused some pain, and he had a tender area just inside the coracoid process. There was nothing abnormal palpable either in the posterior triangle of the neck or in the axilla. He had none of the stigmata of von Recklinghausen's disease, except some suggestive patchy pigmentation of the chest and arms. This pain was regarded as being due to an ulnar neuritis from the pressure of a rudimentary cervical rib, and operation was advised.

On February 22, 1934, Adson's operation of resection of 2·5 centimetres (one inch) of the *scalenus anterior* muscle just above the first rib was carried out to decompress the angle carrying the subclavian artery and the first thoracic nerve. At operation the subclavian artery was dislocated forward at least 1·25 centimetres (half an inch), but the nerves were not touched and nothing abnormal about them was noticed, although the tip of the cervical rib was easily palpated. The patient was discharged on March 3, 1934, but soon returned and stated that he had obtained no relief, and that he thought he could feel something at a spot just medial to the coracoid process. This gave the impression of being a small tumour, was tender on pressure and when palpated caused severe pain down the arm. He also stated that the function of the hand was worse, and that the pain was more constant and more severe. He was readmitted to hospital after some unavoidable delay for further investigation.

Full examination on March 13, 1934, revealed a tumour below the clavicle and a hard tender mass high up in the apex of the axilla. The mass was apparently about 7·5 centimetres (three inches) long and was freely movable. The hand showed marked increase in wasting, there being rather more involvement of muscles than would be expected in a pure ulnar lesion. There was also loss of tactile and pain sensation over the whole of the ulnar distribution. In addition, the hand was colder than that of the normal side and was bluish in colour.

The diagnosis of neurogenic sarcoma was made, and on April 24, 1934, an interscapulo-thoracic amputation was performed. The tumour was found to have obliterated the subclavian vein by pressure, while the subclavian artery and median nerve had been dislocated out of their normal position. The ulnar nerve became lost in the lower part of the mass, which extended up as a spindle-like tumour along the eighth cervical nerve. In order to get at the limits of the tumour the nerve had to be followed as far as the line of the vertebral vein. It was rather doubtful whether the section was completely above all neoplastic tissue. That this doubt was well founded was shown by the fact that microscopical sections of the cut end showed that some neoplastic tissue had been left behind in the region of the intervertebral foramen. The patient made an uninterrupted recovery. As soon as the sutures were removed an intensive course of deep X ray therapy to the area was instituted. The pathological report was fibrosarcoma.

On October 5, 1934, the patient began to complain of some clumsiness and paræsthesia in the left arm, and thought he could feel a lump in that axilla. Examination, however, revealed no abnormality at this time. The patient has been kept under observation ever since, and when examined on November 14,

1934, showed a fixed tender recurrent tumour, about 3·75 centimetres (one and a half inches) long, under the scar and extending deeply into the posterior triangle. The recurrence of this tumour, in spite of and during a course of intensive X ray therapy, is in keeping with its malignant nature and, as the records of cases in the literature show, is typical of the more malignant grades of these tumours.

Reexamination on February 20, 1935, revealed slight increase in hardness of the cervical recurrence (effect of deep therapy), but no other signs of metastases. The patient's pain had disappeared, he had not lost weight, nor were there any pulmonary signs or symptoms.

This tumour showed areas of great activity, the cells being hyperchromatic, often with a typical whorl formation. A few areas of myxoid change were seen, while other areas showed extreme vascularity. There is little doubt that this tumour will very soon cause death from pulmonary metastases.

Case III.—Neurogenic Sarcoma of the Median Nerve.

W.L., a male, aged thirty-eight years, was admitted to hospital on August 18, 1934, complaining of a lump on the inner aspect of the right arm, the lump having been present for two years. The patient first noticed some numbness of the tips of the first and second fingers of the right hand, and that when he bumped the inner side of the right arm he felt pain in the same area as the numbness. At this time he noticed a small tender lump, almost as big as his thumb nail, in the lower medial portion of the right arm. This lump grew steadily until three months before admission, when it commenced to grow much more rapidly. Three months before admission a doctor had made an incision under local anæsthesia over the swelling, but as he found it attached to the median nerve, made no attempt to remove it.

On examination a fusiform swelling, about the size of a golf ball, was palpated 10·0 centimetres (four inches) above the medial epicondyle of the humerus. It lay in the bicipital groove, was tender on pressure, hard on its medial aspect, but soft and semi-fluctuant elsewhere, with a smooth rounded contour. The skin showed a small scar, but was not adherent to the tumour. The tumour could be moved easily at right angles, but not along the line of the median nerve. There was no enlargement of axillary glands and apart from the fact that the man suffered from advanced rheumatoid arthritis in many joints, nothing abnormal was detected on general examination.

At operation on August 21, 1934, the tumour was exposed by an incision over it, the overlying tissues being relatively vascular. It was found to be soft and semi-fluctuant and could be readily isolated from the surrounding tissues. The median nerve fibres were spread out all around the tumour. The tumour, along with about 6·25 centimetres (two and a half inches) of median nerve at either end, was removed intact. When cut into, the tumour was very soft, greyish-yellow in colour on section, and oozed fluid.

The pathological report was neurogenic sarcoma. Parts were cellular and parts necrotic; the tumour was malignant, but the degree of malignancy was uncertain. No evidence of newgrowth was detected in either the proximal or distal segments of the nerve.

Reexamination of the patient on February 16, 1935, revealed a tender swelling thought to be a neuroma at the level of section of the proximal segment. This was not fixed and did not seem to be a recurrence. There was no evidence of any other tumours or metastases.

This tumour is definitely malignant and as it shows giant cells and some irregular mitoses must be regarded as intermediate between Grade I and Grade II, and is extremely likely to recur.

Case IV.—Neurogenic Sarcoma (Primary Diagnosis Myxosarcoma) of the Sciatic Nerve.

E.A., female, aged twenty years, was admitted to hospital in June, 1928, with a complaint of swelling of the right thigh for two months. On examination, a swelling at least 7·5 centimetres (three inches) in diameter was found at the posterior aspect of the middle of the right thigh. It was soft, almost cystic, tender on pressure, not fixed to the skin, but relatively fixed to the deeper structures. There were also many small soft swellings in the subcutaneous tissues all over the body. There was no record of any sensory or motor loss.

On June 18, 1928, a 15·0 centimetre (six inch) incision was made over the swelling; the sciatic nerve was found to be spread over the tumour and seemed to encapsulate it. The tumour was easily shelled out and several smaller ones also. The sciatic nerve as well as the small sciatic nerve seemed to be the seat of numerous small tumours. After three or four of the largest of these were shelled out, the patient was returned to the ward. The pathological report was fibromyxoma, with well formed vessels; no neural elements could be seen in any of the sections.

On November 2, 1928, the patient was readmitted to hospital with the history that the tumour had reappeared at the lower end of the incision. It had grown rapidly and had become very painful. On examination, a large tumour, larger than previously, freely movable but still soft and tender, was found.

On November 5, 1928, the tumour was exposed at operation and found to be partly cystic. It was partly shelled out, and then ruptured, the contents being degenerated material like a broken down sarcoma. The tumour was excised as far as possible, but some was undoubtedly left behind. On November 12, 1928, a course of deep X ray therapy was instituted. The pathological report was "a very cellular spindle-celled sarcoma with embryonic vessels, much hæmorrhage and necrosis".

On December 12, 1928, the patient was admitted to another hospital with a history that the swelling had returned, that it was getting harder and somewhat larger. There was no neuralgia, but the aching pain was still present. The patient exhibited no paralysis of any of the muscles supplied by the sciatic nerve, nor was any loss of sensation demonstrated; full tests were not, however, carried out. There was an ovoid swelling on the dorsal aspect of the right thigh above the knee measuring 17·5 by 25·0 centimetres (seven by ten inches) with an operative scar running across it down the posterior aspect of the thigh. The mass was hard, tender and apparently fixed to the femur. There were a few hard and tender glands in the right groin.

On February 19, 1929, disarticulation at the hip joint was carried out. After treatment for surgical shock, which was extreme, the patient rapidly recovered. Shortly afterwards she complained of some cough and a radiographic examination of the lungs revealed on the right side two opaque areas which were regarded as probably due to secondary deposits.

On May 8, 1930, fifteen months after the amputation of the limb, the patient was admitted to another hospital with the diagnosis of pneumonia. She had remained fairly well until three months before this date, when she contracted a bad cold which was followed by persistent cough. This became worse, and she became dyspnœic and delirious, and developed incontinence of urine.

On examination she had signs of pulmonary consolidation and multiple subcutaneous nodules all over the trunk. The diagnosis of secondary malignant disease of the lung was made and she died the same evening.

Autopsy revealed a massive secondary sarcomatous deposit in the right lung. Microscopic examination showed that the pulmonary metastasis was fibrosarcoma, while the subcutaneous nodules were definitely "fibrocellular".

It is probable that this tumour should be best classified as a secondary neurogenic sarcoma in that the multiple subcutaneous nodules were probably soft neurofibromata, although this was never actually proved microscopically, because no attempt was made to examine these

nodules for nerve elements. The early diagnosis of fibromyxoma is interesting, as these sarcomatous tumours often exhibit a myxomatous structure, which is often misleading.

Case V.—Neurogenic Sarcoma of the Right Vagus Nerve.

A.F., a male, aged sixty-five years, was admitted to hospital on August 29, 1930, with a history that three months previously he had accidentally discovered a lump in the right side of his neck. The lump grew slowly, was never painful and produced no symptoms of any kind. On examination he seemed to be a very healthy man for his age. The tumour was ovoid, very hard, measured four centimetres at its longest diameter. It was attached to the under surface of the sterno-mastoid muscle and also to the deeper tissues. Is exact origin was hard to determine, but as it lay along the line of the great vessels, the diagnosis of carotid tumour was suggested. Full investigation of the areas drained by the lymphatic glands of this region was carried out, but no primary growth could be detected anywhere, nor were there any symptoms suggestive of such a primary growth.

On September 4, 1930, at operation an obviously invasive malignant tumour which arose either from the carotid body or the vagus nerve was exposed. It was closely attached to the carotid sheath, the vagus nerve disappeared into it, while the internal jugular vein was completely surrounded and infiltrated and its lumen was invaded by the neoplasm. Portion of the internal jugular and a section of the vagus nerve were removed with the whole tumour, which extended to within 2·5 centimetres (an inch) of the jugular foramen. The patient was discharged on September 15, 1930, and a course of deep X ray therapy was instituted.

The pathological report was as follows:

"*Macroscopical Appearance.*—The tumour is in the main well defined, but in places it has infiltrated the surrounding fat and muscle. It has a pale yellow colour with some opaque areas which suggest cell necrosis. The external jugular vein runs through one-half of the tumour, and it can be seen that the tumour has replaced the wall and actually invaded its lumen.

"*Microscopical Appearance.*—The cells vary in size and shape, many are irregularly stellate, others are spindle shaped, while many much nucleated giant cells are present. There is also a great deal of nuclear irregularity. The stroma is scanty, but in some places hyaline. The tumour is certainly highly malignant and is probably of neurogenic origin."

There seems little doubt that this neoplasm is really a neurogenic sarcoma, derived from the vagus nerve—a well known site for such neoplasms.

On January 16, 1931, the patient was readmitted to hospital with a history of pleuritic pain which developed suddenly. He had not lost any weight and appeared fairly well, but under the scar in the neck was an infiltrating mass which had gradually increased in size in spite of deep X ray therapy. The pleuritic pain persisted, no pleural effusion of any appreciable size developing, however. X ray examination did not detect any shadows in the lungs, although clinically it was believed that his signs and symptoms were due to subpleural secondary neoplasms. He began to lose a little weight and his respiratory distress persisted. He was discharged unrelieved on February 20, 1931.

In July of the same year, nine months after operation, the patient, after a gradual progression of all his symptoms, with loss of weight, anæmia and respiratory distress, died at home, no autopsy being obtained. From the history given by his relatives there is no doubt that he had multiple pulmonary metastatic deposits.

PATHOLOGICAL ANATOMY OF NEUROGENIC SARCOMA.

These solitary neurogenic sarcomata usually appear well encapsulated, hard and homogeneous fusiform tumours, with little tendency to degenerative changes. They involve the larger nerve trunks as a rule, and destroy nerve fibres in proportion to their cellularity and rapidity of growth. They are freely movable and infiltration appears to be totally lacking. (See Figures I, II and III.)

FIGURE I. Tumour from Case I. Neurogenic sarcoma of the sciatic nerve, showing the well developed capsule and homogeneous nature of the cut surface.

The cut surface shows a uniform fleshy appearance, often looking like soap, but at times with the definite striated appearance of fibrosarcoma, at times quite vascular and at others very hard and white. In the softer types, which show a striking predilection for the thigh region, there may be small areas of hæmorrhage, areas of myxoid and cystic change or pigmentation.

Microscopic Appearances.

The microscopic appearance varies a great deal, but in all there is little difficulty in recognizing the sarcomatous nature. Some of the firmer and more slowly growing tumours are fibrous, and, although they are true fibrosarcoma, are sometimes wrongly diagnosed as fibroma. While there may seem to be some grounds for this diagnosis, the cellular nature of some areas, the character of the nuclei, the characteristic whorled appearance, and the relationship of the component cells to the small vessels are always sufficient to denote their

FIGURE II. Tumour from Case II. Neurogenic sarcoma of the inner cord of the brachial plexus, showing dislocation of the structures of the axilla.

FIGURE III. Tumour from Case III. Neurogenic sarcoma of the median nerve, showing spindle shape, well marked encapsulations and lack of infiltration. (Photograph by courtesy of Dr. Keith Inglis, Kanematsu Institute, Sydney Hospital.)

sarcomatous nature. It cannot be too strongly urged that unless nerve fibres are present in the main tumour mass, evidence of a truly neuro-fibromatous nature, all these tumours should be classed as fibrosarcoma. Ewing states that when the bulk of cells exceeds the matrix, the tumours are usually of active growth and tend to recur. In the more cellular varieties the diagnosis is obvious, the picture being that of

FIGURE IV. Section of tumour from Case II, showing spindle celled fibrosarcoma with typical whorled appearance. Grade I/II malignancy. × 140.

classical spindle celled sarcoma. In these, evidence of irregular nuclear division and giant cells are common, the presence of the latter being always very significant. The type cell is hyperchromatic, spindle or polyhedral in shape, in some the tumour seems fibrous, but in others the cells are closely packed together with here and there larger and atypical giant cells. In others, areas of cystic change, hæmorrhage, myxomatous change or telangiectases are seen, and it has been suggested that it is the latter variety which is so prone to pulmonary metastases. Figures

IV, V and VI illustrate various appearances of the sections of the cases under review.

Nerve fibres are rarely found in these tumours, owing to the fact that, if ever included, they undergo degeneration and are destroyed, their place being taken by the neoplastic cells. As the tumour becomes larger, the tissue becomes more cellular, the appearance more diffuse,

FIGURE V. Section from Case IV, showing spindle celled hyperchromatic tumour. Grade II/III malignancy. × 140.

and the neoplastic cells spread along the line of the nerve fibres so that they really extend much further than is apparent. Quick and Cutler[15] point out that myxomatous degeneration with almost complete replacement of the tissue cells by a cellular myxoid tissue is sometimes seen. The occurrence of this myxoid tissue in these tumours is of great interest, and sometimes it would appear as if this tissue is also found at the limits of the neoplastic erosion, and may be the first evidence of the tendency towards such an invasion. It is often seen in recurrent tumours.

GRADE OF MALIGNANCY.

The grade of malignancy is important, and an attempt has been made by Quick and Cutler[15] to grade these tumours as regards malignancy on their cellular structure. This is always difficult, particularly as they may differ so much as regards cellularity in different nodules or areas of the same tumour; and it is particularly difficult

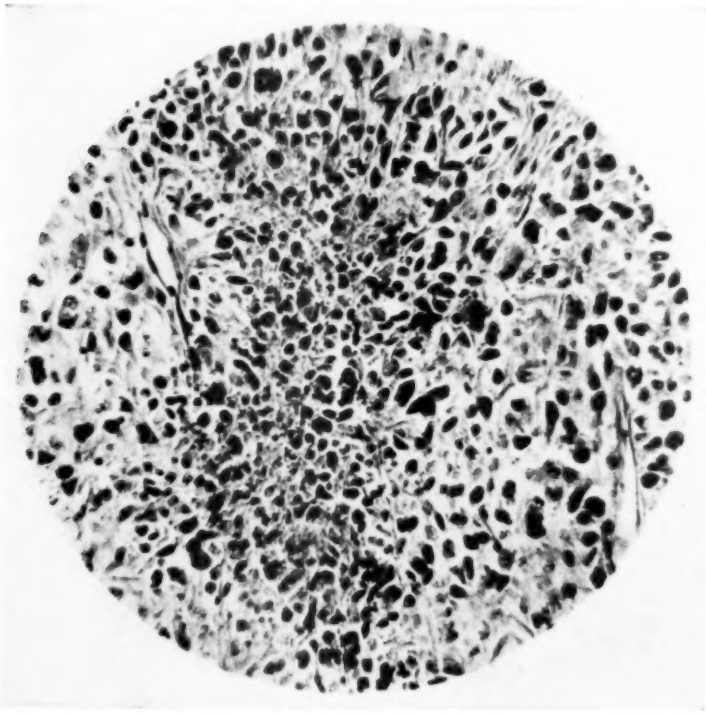

FIGURE VI. Section of tissue from Case I, showing active type of growth with giant cells. Grade III malignancy. ×140.

in recurrent cases, because, as is not uncommon in all tumours of this nature, the growth tends to become more cellular and active. The more fibrous variety, which is composed of spindle cells lying in a relatively abundant hyaline stroma (Grade I), runs a long clinical course and, until stirred into activity by injury or operation, is of relatively low grade malignancy. Grade II, showing interlacing whorls of hyperchromatic spindle cells, less intercellular substance, possibly rare "tumour" giant cells, is intermediate as regards malignancy, but is the

most variable of them all, while Grade III, with its giant cells and vascular structure, with a marked tendency to metastasize in the lungs, is of high grade malignancy.

One cannot help being struck by the fact that histopathologists in general have not yet realized that these spindle celled fibrosarcomatous growths may be very malignant and that they should be extremely careful not to mislead by reporting them as of low grade malignancy.

METASTASES.

Like all sarcomata, invasion of the blood stream with the formation of metastases in the lung—as in Cases IV and V—is a common phenomenon and the usual ultimate cause of death, the other viscera or soft parts not being commonly the seat of metastases. In a series of 75 cases of neurogenic sarcoma of mixed types, Quick and Cutler found 15 cases with pulmonary metastases. Secondary deposits in the subcutaneous tissues are, however, well known. Lymph gland involvement is apparently practically unknown. It is important to realize, too, as Krause first pointed out, that in some cases an apparent metastasis, particularly if situated peripherally, may be in reality a new primary tumour.

HISTOGENESIS.

When one comes to consider the histogenesis of the cells of these tumours, difficulties at once arise. In many cases, of course, by the time the growth comes to the pathologist it is so large that all trace of its source of origin has gone. At present there are two main schools of thought, the first, which is supported strongly by Penfield, Mallory and other American pathologists, believes that all these tumours are derived from the supporting endoneurial connective tissue and that they are therefore mesodermal in origin. They, after correlating all the "sheath" tumours of peripheral nerves, lay great stress on the production and deposition of collagen fibres, which they maintain are produced by connective tissue cells only. Hence they would class practically all the tumours of peripheral nerves, whether benign or malignant, as mesodermal in origin. Masson, following Verocay and others, has always taken the view and has backed this up by very conclusive and logical articles based on some experimental work, that some, if not all, of these sheath tumours are derived from the Schwann cells of the sheath, and as these cells are migrants from the neural crest are therefore ectodermal in origin. He would therefore class these neurogenic sarcomata as malignant schwannoma. As is well known, he also regards as neurogenic tumours the melanomata which arise mainly in the skin. He is gaining more and more adherents in all parts of the world and by attempting to correlate all the pathological manifestations of these neurogenic tumours has put all students of pathology in his debt. The question is one that mainly concerns histopathologists, and as it has not a very close bearing on the clinical aspects of these tumours, will not be further discussed here.

CLINICAL ASPECTS.

Age.—The age incidence varies between 16 and 40, reaching a peak period at 25 years of age for the first group, but in the case of sarcomata secondary to neurofibroma there seem to be two peak periods, one between one and 10, and the other between 40 and 50.

Length of History.—In the solitary neurogenic variety (Group I) the length of history is often relatively short, and in the cases here recorded ranges from six to twenty-four months; but, even so, cases of this type have been reported in which a tumour had been present for a number of years. In these cases the tumour has usually been of the Grade I type of Quick and Cutler.

In the secondary neurogenic sarcomata (Group II) there is often a very long story of a quietly growing tumour which has been present for as long as twenty years. At times it undergoes a rapid spontaneous change, growing rapidly in size with the production of definite neuritic symptoms, while at other times this change has apparently been induced by trauma or ineffectual operation.

Signs and Symptoms.—Pain is the most outstanding symptom, commencing particularly as a dull aching pain, worse at night, varying in much the same way as rheumatic pains do. The pain radiates along the course of the nerve and at times is associated with paraesthesia in the area of distribution of the nerve (Cases I and II). Sometimes the pain is intense and of a neuralgic nature, requiring morphine for its relief.

Careful examination often reveals varying degrees of sensory loss, depending on the degree of destruction of the nerve fibres.

Motor phenomena also occur and both these and the preceding give an accurate index of the amount of infiltration and destruction of the nerve fibres. Paresis followed by paralysis was seen in two of the cases here recorded.

In a great number of cases, 60% to 70%, the progressive nature of the pain directs the patient's attention to the region, and the discovery of a swelling is the result. The swelling may be extraordinarily tender and on palpation pain may be referred to the distribution of the affected nerve.

The tumour is usually discrete, hard and readily movable in the surrounding tissues, but relatively fixed when movement is made along the long axis of the limb. This is often misleading in that it may lead to the belief that the tumour is benign. In the more rapidly growing variety the tumour may be the seat of myxomatous or cystic change and so be relatively soft on palpation (Case IV).

In the recurrent cases the symptoms are much the same, but the mass is usually nodular and fixed, showing definite evidence of infiltration of the surrounding tissues.

In Group II there is always evidence of some of the stigmata associated with von Recklinghausen's disease or neurofibroma, and in cases of neurogenic sarcoma these should always be carefully searched

for. It is probable that more accurate examinations will show that some of the primary neurogenic sarcoma (Group I) can be regarded as showing some of these stigmata. Thus in Cases II and III above, there were areas of cutaneous pigmentation which resembled that of von Recklinghausen's disease very closely. It will be interesting to note whether or not the other fibrosarcomata of the extremities, cases (Group III) of whose neurogenic nature there is some doubt, also show these stigmata in a high proportion of cases.

Differential Diagnosis.

This rarely entails any difficulty, although if the primary and secondary groups are to be differentiated, careful examination for other nerve tumours and for the varied stigmata of von Recklinghausen's disease should be carried out. A greater difficulty occurs in determining whether or not a tumour directly attached to a nerve is an innocent neurofibroma, fibroma, or a neurogenic sarcoma. Thomson insisted on the existence of innocent fibromata of nerves, stating that they did not affect the nerve fibres, that they rarely grew larger than a hazel nut, and that their slow growth (no change for up to eighteen years) had earned them the title of "permanent tumour". He recorded five cases of this type which seem to be completely authentic. It is under this heading that he includes the "painful subcutaneous tubercle". He insists that these tumours may be very tender, palpation causing pain to shoot down the nerve, especially in those situated superficially. In the deeper innocent fibromata these symptoms are often entirely lacking, while in all, objective motor and sensory loss are apparently unknown. Rarely is an innocent tumour solitary, and still more rarely are they very painful. The rate of growth often helps, but not always, because the low grade malignancy of Type I is sometimes associated with very slow growth for many years. There seems to be no method, apart from the above, of detecting these rare innocent solitary growths, so that, generally speaking, all solitary tumours should be regarded with the greatest suspicion.

Treatment and Prognosis.

In the past most surgeons have been content with a local removal of the apparently well encapsulated tumour. Very often this excision has not been carried out sufficiently wide of the disease and at times an attempt has been made, in spite of the advice of many of the older observers, to try to preserve as many of the nerve fibres of the affected nerve as possible. That this non-radical method of removal is absolutely wrong can be conclusively proved by a study of the recorded cases. The literature contains hundreds of examples now of the same tragic story—recurrence usually in a much more cellular and active form at varying times after operation. Sometimes recurrence takes place within a few months, though it may be delayed for years. It speaks volumes for the persistence of both patient and surgeon that many multiple operations for recurrence (up to 20) have also been recorded. These

recurrences very often take place in the scar and soft tissues, but are sometimes seen in the trunk of the affected nerve either above or below the original lesion, and in many cases the condition soon progresses far beyond either surgery or radiation therapy. It seems that the recurrence does not always arise from cells of the original primary tumour left behind at operation, but that the neoplasm is actually or potentially multicentric. In the secondary type recurrence may be at a distance, while it is not uncommon in this type for a neurofibromatous tumour in another part of the body to undergo sarcomatous change. From the records it would seem that, considered generally, this sarcoma has the same insidious characteristics and degree of malignancy as sarcoma of bone and the mortality is nearly as great. It appears as if in this secondary type the patient is always in danger of this development in any of the areas of neurofibromatosis, so that, although apparently a little less malignant histologically, they are, from the point of view of recurrence, quite as serious a problem as the primary type. Stewart and Copeland agree with this view, and state that none of their patients who came into the von Recklinghausen group were free from the disease for five years after operation. In this connexion Thomson[5] (page 29) may be quoted:

> There were only 2 cases out of 12 in which removal of the tumour along with a portion of the nerve affected has resulted in a cure of two or more years' duration. We may therefore conclude that, while conservative operations have been successful in a very small proportion of the recorded cases of malignant neuroma (analogous to the results obtained in sarcomata of the long bones of the limb), the best and in the majority of cases the only chance lies in early and high amputation.

It would seem that even in those of relatively low grade malignancy, for any chance of success, operation must be as radical as possible. The nerve trunk, as advised by Krause, must be exposed fully both above and below, and no attempt must be made to save the nerve. The tumour should be graded as regards malignancy and if of the more malignant group (II and III), amputation well above should be advised at once. If recurrence, no matter how small, takes place, amputation well above gives the patient the only chance. The number of pulmonary metastases developing in patients in whom amputation has been long delayed during a period of repeated local surgical interferences helps to confirm us in this view. These sarcomata must be taken much more seriously by surgeons if the long list of tragedies, already much too large, is not to be added to.

THE QUESTION OF BIOPSY.

Cutting into these tumours, even with the electric loop, for the purpose of biopsy is to be strongly condemned. The procedure, as a rule, adds little to the information obtainable by simple inspection, while it removes the limiting zone of tough fibrous tissues, allowing neoplastic cells to escape and infiltrate the soft tissues, so that a much wider excision ultimately becomes necessary. Even with the greatest

care, it is almost impossible to prevent some contamination of the operative field.

THE QUESTION OF THE APPARENTLY INNOCENT NEUROMA.

It is always a difficult matter to know what to advise in the case of a very slowly growing neurofibromatous tumour which is, from the nature of its symptoms, obviously not infiltrating or destroying nerve function. It would seem that, unless the tumour is producing severe pain or is progressing, or has produced some objective interference with the function of a nerve in the form of motor loss or sensory disturbance, it should be left alone. There seems little doubt that these fibromatous (*sic*) tumours, if interfered with, are exceptionally prone to recur, the operative trauma apparently being likely to induce sarcomatous change. It would seem that operation in some of these cases often only serves to make a primarily innocent tumour a malignant one, and so to shorten the life of the individual.

THE QUESTION OF DEEP X RAY THERAPY.

Although complete information with regard to the efficacy of this mode of therapy, either as a prophylaxis against recurrence or as a curative measure apart from operation, is not yet available, enough evidence has been accumulated, particularly at the Memorial Hospital, New York, to show that it has a very limited value.

Effect on the Original Neoplasm.—From the evidence available there is no doubt that the majority of these tumours are very radio-resistant, and that radiation therapy without operation holds out little hope of actual cure. This fact has been emphasized by Quick and Cutler, and they suggest that, as most of the other cellular sarcomata with which these tumours may be confused react rapidly to deep X ray therapy, this can often be used as a therapeutic test to aid in diagnosis. Stewart and Copeland[10] believe that a small number of excellent results have followed intensive external radiation alone, the tumour growth being apparently delayed by a process of slow sclerosis, the results in the higher grade of malignancy, however, being very disappointing. Regaud and Roux-Berger[16] also emphasize the radio-resistant nature of these growths.

Post-Operative Prophylactic Radiation.—It has become the usual practice to institute intensive deep X ray therapy after operation on this type of neoplasm, in the hope that any neoplastic cells which may be left behind may be killed and so prevent local recurrence. That this may at times be useless is shown by the fact that, although there is a lack of uniformity in the intensity of the radiation therapy given, many cases have been recorded (as in Cases II, IV and V above) in which an active recurrence took place while the patient was actually under a course of this treatment. It has been suggested that it might be wiser to withhold this treatment, which tends to exhaust the tolerance of the normal tissues so much that if recurrence does occur at a later date,

their reaction to the treatment is insufficient to have any effect. Because of this it has even been suggested that this mode of therapy should be used only after recurrence manifests itself, and then a short intensive course should be instituted. The consensus of opinion, however, is in favour of intensive deep therapy treatment, instituted before dense scar tissue can form, the treatment being so planned as to deliver a maximum quantity of radiation through multiple portals of entry in the skin.

Effect on the Recurrence.—The effect on the recurrence again is extremely variable and, owing to the radio-resistant nature of these growths, apparently very slight. In fact, it is dubious whether deep therapy has much value in these cases. It will, therefore, be interesting to find what effect this treatment will have in Cases I and III, in both of which intensive courses were given.

SUMMARY.

1. Neurogenic sarcoma may occur in the larger peripheral nerve trunks as a primary solitary neoplasm, or secondary to a primary neurofibroma, in which case other manifestations of this disease should be searched for.

2. This tumour is a very treacherous one, of varying degrees of malignancy, but extremely prone to recurrence and finally to cause death from pulmonary metastases. A study of many recorded cases shows that the prognosis after conservative measures is extremely gloomy, the mortality approaching that of bone sarcoma.

3. If operation is undertaken it should be radical; no conservative measures are of any avail, and, if recurrence, which is very common, takes place, amputation holds out the only chance of saving life.

4. Operative interference with slowly growing nerve tumours with few symptoms should not be lightly undertaken, owing to the risk of inducing sarcomatous change.

5. Deep X ray therapy has a very limited and rather disappointing effect on most of these neoplasms, but the consensus of opinion is that with a view to limiting recurrence, it should be used intensively as soon after operation as possible.

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FACIAL HEMIATROPHY, WITH A DESCRIPTION OF THREE CASES.

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Introduction.

A process the reverse of natural growth, such as a diminution in bulk of all the tissues of one side of the face, is too noticeable a phenomenon to have escaped the attention of the older clinicians for long. Although a patient with such a condition was described by Parry in 1825, it was not until Romberg's description in 1846 of the disease which was to bear his name, that general attention was focused upon the condition.

During the last eighty-eight years much attention has been paid to this remarkable ailment. Various authors, mainly French or German, have devoted monographs and theses to its description, and have put forward hypotheses as to its origin. On the whole, it has not received such marked attention from English or American authors. However, Archambault and Fromm[1] have recently reviewed the subject in a judicial article which has been of great value to us in the preparation of this paper. Besides giving a valuable survey of the literature to the time of publication, they have abstracted many significant cases not available to every reader. Since its publication several other examples of this uncommon condition have been reported, making the total number of cases now described in the literature well over 400. One important case with a full autopsy was reported by Stief in 1933.[2]

We are content to describe three patients with facial hemiatrophy who have come under our notice, and to touch upon certain principles which may be applied in its treatment. We have no new features to add to a condition which has already been adequately described; nor do we feel that we have any fresh evidence to put forward which might assist in the solution of the mystery of its origin. Its general description and ætiology will accordingly be only lightly touched upon.

Ætiology.

Facial hemiatrophy, or the Parry-Romberg disease, may occur at any period of life. It is, however, predominantly a disease of early

life, being particularly apt to occur in the second decade. In the three patients to be described it was noticed in one at birth, in a second at the age of three or four, and in the third at the age of thirteen or fourteen. Congenital cases, as in Case II, have been reported.

In a certain number of cases, possibly about 25%, it has been described as following local trauma. Thus one of Archambault and Fromm's patients, a girl of seventeen, received a blow over the right cheek two weeks before wasting of the tissues of this part of the face was noted. Trauma did not, as far as could be determined, enter into the ætiology of the condition in our three patients.

From a review of the large number of cases now reported, there seems to be little difference in the sex incidence. All three of our patients were of the male sex.

At times an acute illness has preceded facial hemiatrophy; it is difficult, however, to prove the direct relationship of the two conditions. Various infective conditions of the jaws and naso-pharynx seem to have preceded the onset on occasions, while a not inconsiderable number of patients have developed it subsequent to the removal of teeth.

Difficult as it is to evaluate the rôle of the infective diseases in its causation, there seems little doubt but that tuberculosis of the apices of the lungs has been found in an unduly large proportion of patients suffering from facial hemiatrophy. Moreover, tuberculous disease has been discovered in three of the four cases which have so far come to autopsy. The bacillus of tuberculosis itself is not of such importance as the effect of the tuberculous lesion upon the neighbouring sympathetic chain.

It is remarkable how often lesions in the region of the cervical sympathetic nervous system, either at its outflow from the spinal cord in the upper thoracic roots, or during its course in the neck, have preceded the onset of facial hemiatrophy. Thus in Stief's case, which came to autopsy, lesions of the upper and inferior cervical ganglia and of the upper paravertebral ganglia were found on the side of the hemiatrophy. Moreover, it has been observed with a wasting and weakness of the hand associated with a cervical rib (Ascher). Foster Kennedy[3] mentions a man who developed great pain in his left arm after wrenching his shoulder. He was found to have a bilateral cervical rib, and a characteristic cervical rib syndrome of the left hand. Horner's syndrome developed on the left side, and with it a well marked hemiatrophy of the left side of the face.

Paralyses of the brachial plexus of the Klumpke type have been followed by a facial hemiatrophy of the same side on several occasions. Horner's syndrome has often accompanied the condition.

Many patients have been reported in whom facial hemiatrophy has followed conditions which may have injured the cervical sympathetic in the neck; these include thyreoidectomy, the removal of the cervical glands, the presence of an enlarged thyreoid gland, or a malignant tumour of the neck.

The hypothesis of its origin from some affection of the cervical sympathetic was originally propounded by Seeligmüller in 1875, and has many adherents. It must be confessed that it cannot be lightly dismissed; the occurrence of an incomplete or a complete Horner's syndrome on the side of the atrophy, even in the absence of any known injury or disease of this part of the nervous system, is far from uncommon.

The examinations of many individuals suffering from facial hemiatrophy have elicited evidence of organic lesions of the diencephalon, the mid-brain, the pons, the medulla, or the upper part of the spinal cord, areas in which lie nuclei and tracts associated with the vegetative nervous system. Marburg has referred to seven patients with syringomyelia associated with this condition, three of them showing a distinct Horner's syndrome. Since the publication of his cases, others have been collected which he appears to have overlooked. Moreover, additional cases have been reported, and also its association with certain traumatic lesions of the cord, thought to be hæmatomyelia.

Isolated but inexplicable signs suggesting some disturbance of the mechanisms associated with the sympathetic nervous system in the region of the mid-brain or posterior part of the third ventricle have been encountered. Thus, of the three patients described by Archambault and Fromm, the pupil of one was dilated on the side of the atrophy and would not react to light; a second showed on the side of the atrophy a widened pupil, pallor of the skin and relative anhidrosis after the injection of pilocarpine.

As might be expected from such observations as these, it has been suggested that lesions of the periependymal grey matter of the Sylvian aqueduct and of the third ventricle may be responsible for facial hemiatrophy. Should this be proven, it would explain the spread of the atrophy outside the zone of the cervical sympathetic, as in those rare cases where the entire half of the body has undergone atrophy. A central lesion might also explain the still rarer cases of crossed atrophy, in which atrophy of the face has occurred on one side and that of the body on the other.

However, paralysis of the cervical sympathetic is not uncommon, and facial hemiatrophy forms no constant part of its syndrome. In explanation of its occasional presence, Archambault and Fromm write:

> We believe that the condition is due to a lesion of the sympathetic nervous system of mixed type, partly destructive and partly irritative (the equivalent of the newer "release phenomenon") in which the destructive component probably predominates.

This suggestion undoubtedly deserves consideration, but requires further proof than is at present to hand. Nor can a disturbance of the sympathetic nervous system be shown in all patients with hemiatrophy of the face. It was carefully sought for, but not found in our Cases I and II, and was not observed in Case III. This cannot, however, be held to eliminate the disturbance of some nervous impulse of a trophic

nature as a cause. The distribution of the lesion and its usual strictly mid-line delimitation from the normal side strongly suggest a nervous rather than a vascular origin.

An affection of the trigeminal nerve has been held responsible for facial hemiatrophy. In two of the four cases which have been examined at autopsy, lesions of the trigeminal nerve have been found. In Mendel's case a peripheral neuritis was found most marked in the second division; in addition changes were found in the brain stem. In Loebel and Wiesel's case an interstitial neuritis occurred in all three trigeminal divisions, involving the mandibular and maxillary divisions with equal severity.

The presence of facial pain, the occurrence of herpes, and occasional disturbance of sensation in the zone of this nerve have been thought to indicate this origin. However, any marked sensory disturbance is uncommon in this condition; moreover, the persistence of facial pain after section of the fifth nerve in certain patients with "atypical facial neuralgia" leaves no doubt but that facial pain may occur independently of this nerve.

In the third patient of this series a subjective numbness was noted under the eye, and about the angle of the mouth several years after the occurrence of the hemiatrophy and a dulling of sensation could be demonstrated. This need not imply that an affection of the trigeminal nerve had caused the atrophy; it might indicate a change within this nerve subsequent to an alteration in the bony canals produced by the atrophy. Gowers suggested this origin for the occurrence of the facial paralysis which may sometimes occur in the course of the illness. Furthermore, even if an affection of the trigeminal nerve could be established as causing facial hemiatrophy, we must remember that in its peripheral divisions lie fibres which have to do with both sympathetic and parasympathetic systems. These equally with the true trigeminal fibres would be liable to be affected.

Atrophy of the face may possibly occur after lesions in the course of the fifth nerve. Trotter[4] has described a girl of eleven, who had suffered from recurrent attacks of herpes over the region of the second division since the age of one. The cheek was markedly atrophied over the affected side. It was suggested that the lesions were the result of inflammation of the Gasserian ganglion.

Harris[5] mentions a woman suffering from morphœa, with a left trigeminal neuritis of the first division and, to a less extent, the second. The left eye was sunken; the left frontal bone and left maxilla were much wasted, although this wasting failed to extend to the mid-line.

Complete or partial section of the trigeminal nerve, or its injection with alcohol, has not, as far as is known, resulted in hemiatrophy. Moreover, the atrophy may spread to, or originate in, areas well outside the zone of influence of the trigeminal nerve. Although it cannot be dogmatically stated that certain cases of facial hemiatrophy do not originate from an affection of the trigeminal nerve in some part of its course, if such cases do occur they must be rare; at the same time

such cases would not necessarily be due to a lesion of the trigeminal elements of the nerve.

The relation of facial hemiatrophy to scleroderma requires consideration. Hemiatrophy of the face may result from scleroderma, or may seem to occur independently, scleroderma being present in other parts of the body. It is only to be expected then that there should be many adherents of the view that the two diseases are identical. Perhaps the presence or absence of some characteristic, as atrophy of the skin, should not be used to attempt to discriminate too critically between these two conditions as seen in the face while the causation of either remains unknown. The relationship must remain as yet a moot point; both conditions have been included rightly or wrongly in a class of diseases described as trophoneuroses.

A disturbance of the ductless glands has been thought to be responsible for facial hemiatrophy, although there seems little justification for such a view.

It may be said then that the most likely cause of facial hemiatrophy is some obscure disorder of innervation. This may possibly occur as the result of some central disturbance, or from the affection of certain fibres travelling in such peripheral channels as the cervical sympathetic or the trigeminal nerves.

CASE HISTORIES.

Case I.

A single man of thirty-one years presented himself for examination on August 19, 1932. He complained of "turns" which had occurred periodically over a period of twenty-six years. A peculiar feeling would come over his head, and he would then lose consciousness. He had often fallen in these attacks, and had injured himself on occasions. He had experienced as many as five during one month, but had had periods of from three weeks to eleven months without an attack.

At the age of either three or four years a white mark was noticed under the right eye. Whether the atrophy present in his face had spread from that area he was unable to say, but he stated that his face had "stopped growing" at that age. He was now the possessor of a right facial hemiatrophy of the grossest type, concerning which he was so sensitive that he deliberately avoided people, and would often take his "swag" and wander alone into the country. He was in excellent general health and fond of athletics. There was nothing else of significance in his history.

On examination he was found to be a well nourished and well developed man, showing a right facial hemiatrophy (Figures I and II). On general examination no defect was noted; his systolic blood pressure was 110 millimetres of mercury; his urine contained neither albumin nor sugar.

A full neurological examination revealed no abnormality. His pupils were of equal size and reacted well to light and to accommodation. There was no sign of any vasomotor or secretory anomaly which might indicate a lesion of the sympathetic nervous system. Full sensation was preserved over the area innervated by the trigeminal nerves, and the masticatory muscles showed no weakness.

The right side of the face was considerably smaller than the left, the regions of the cheek and of the chin being much more affected than the forehead. The area of atrophy was sharply differentiated from the opposite side; on the lip and on the chin this was indicated by a well developed furrow and falling away of the tissues of the right side; on the face a shallow furrow was present.

to the right of the mid-line, the corrugations of the forehead on the two sides being distinctly different in type and position. The skin over the atrophied area was itself atrophic and thin; this area extended down into the neck region and behind to the ear. The right ear was somewhat deformed,

FIGURE I. Case I. Side view of patient.

FIGURE II. Case I. Front view of patient.

FIGURE III. Case I. Tubed pedicle graft in place.

FIGURE IV. Case I. Tubed pedicle graft in place.

displaced and turned forwards. Very little subcutaneous tissue was present on the right side, although it was ample on the left. The right maxilla and mandible were very small, and the palate was narrow. The orbit was little

diminished in size, the nose also not participating in the atrophy, although drawn to the right.

He was irritable and suspicious and extremely sensitive concerning his deformity. He was prepared to undergo any operation for its relief, even if it were not successful. He felt that as he was he appeared deformed; if he showed one or more scars it might suggest that the condition was the result of a wound.

He was given "Luminal" for his epilepsy and admitted to the Alfred Hospital on September 7, 1932, for surgical treatment. Two days later a tubed pedicle was made by lifting a strip of skin and subcutaneous tissue, 5·0 centimetres (two inches) in width, extending from the lower jaw in the neighbourhood of the facial artery to just below the left clavicle (Figures III and IV). Two

FIGURE V. Case I. Side view of patient two years after operation.

FIGURE VI. Case I. Front view of patient two years after operation.

weeks later, when the tube was healed, a flap in excess of that necessary was outlined at the lower end of the pedicle by incision through skin and subcutaneous tissue, this incision being closed by suture.

The purpose of the operation was to cut off, from the area of skin and subcutaneous tissue to be transplanted later, such blood as entered it from the surrounding tissues and thus to determine the nourishment of the flap on the tubed pedicle.

On October 4 the area of atrophy in the right cheek was denuded of its thin epithelium; a pattern of the raw surface was made and a corresponding flap of skin and fat was lifted at the lower end of the tubed pedicle and sutured in position in the cheek. Ten days later, when it became fixed in its new position, the flap was freed from its pedicle, and the latter was opened out and replaced in its original site in the left side of the neck.

When last seen a few months previous to this article going to press, the man expressed himself as delighted with the results so far achieved, and said that he had, by regularly taking "Luminal", no return of his epileptic seizures (Figures V and VI).

Case II.

A boy, aged four years, was examined on July 2, 1934. He was brought by his mother on account of a marked asymmetry of his face. The mother said that he was a perfectly healthy child, one of two, the other being a healthy boy of ten.

He was a full-time child; his birth had been normal and no forceps were used. After birth he was noticed to have what was thought to be a slight facial

paresis; at a later date, as the left nasal cartilage did not seem perfectly joined to its fellow and to have a somewhat bifid appearance, it was suggested that he might have an "intending hare lip". The condition had apparently become more marked as development proceeded; the mother was, however, of the opinion that it had not progressed of late, and might have actually improved. This she thought was particularly noticeable in the region of the forehead. He was a healthy boy, and suffered from no "fits". He had, however, a congenital convergent strabismus, for which he was about to undergo treatment.

For a boy of four he was well built and nourished. In addition to the asymmetry of his face, a left internal strabismus was present. The two sides of the face were asymmetrical, but not to such a gross degree as in the previous case. Thus it could not be immediately stated which side was abnormal; that is, whether the right side was hypertrophied or the left side atrophied. By considering each side apart from its fellow it was concluded that the right side more accurately represented what might be expected in a boy of four.

FIGURE VII. Patient in Case II.

The details of the atrophy may be gathered from Figure VII. The left sides of the lips were small as compared with their fellows, and the left palate was narrower than the right. The left lower jaw and maxilla were much smaller than those on the right side; the left frontal bone was only slightly smaller than the right, the left supraorbital ridge being distinctly narrower than its fellow. The temporal fossa on the left side was more sunken than that on the right.

The skin was not atrophic, but was of normal appearance and similar on the two sides. Each cheek showed a slight growth of downy hair, and presented the usual normal healthy flush. The left eye had the appearance of being smaller than the right, the left ear was not involved, but was on a slightly different plane to the right. The left side of the nose was somewhat smaller than the right. The rest of the body showed no asymmetry.

General examination revealed no abnormality of the viscera. The urine contained neither albumin nor sugar.

A general neurological examination revealed no abnormality. The cranial nerves were intact. The function of the fifth nerve was apparently normal, the corneal reflexes were equal and active, and no abnormality of sensation was present. The pupils were equal and reacted to light and accommodation. No abnormality of the cervical sympathetic was detected. The deep reflexes were sluggish but equal. The superficial abdominals were equal and active; the plantar reflexes were flexor in type.

In this boy, then, some asymmetry of the face was noticed at birth. This had progressed as a general wasting or lack of growth involving mainly subcutaneous tissues, muscle and bone of the lower part of the face. The skin was not noticeably involved in the process. No defect could be noticed in the functions of the trigeminal nerves, or of the cervical sympathetic.

In a child of the pre-adolescent period, when growth is still proceeding, the manifestation of this peculiar disease might be expected to be somewhat different from that occurring in a more fixed period of life. Thus it is not felt that it can be said that this boy's face had

atrophied from birth; the left side of the face is obviously not less than that which might be expected in a full-time child. It seems, then, to us that the causal factor has resulted more in a retardation of development than an actual atrophy. At the same time there does not seem any adequate reason for removing this case from the class described as facial hemiatrophy.

Case III.

A man, twenty-eight years of age, presented himself for examination and treatment on March 29, 1927, for a marked asymmetry of his face. He stated that he had first noticed this at the age of twenty, and that three years before its occurrence he had suffered from severe pneumonia. His mother, however, thought that it had been present at the age of twelve or thirteen. It was still progressing and becoming more noticeable.

About four to five years before he had noticed a numbness below the left eye and at the left corner of the mouth.

He had one brother, aged twenty, who was of good health and normal appearance.

On examination he had a pronounced left facial hemiatrophy, and showed a very marked cleft in the chin. The skin was not atrophic and was of normal appearance; the tongue was normal. Unfortunately he was not photographed at this time, nor was a detailed description of his condition made.

The general systemic examination revealed no abnormality. He presented no neurological features excepting some alteration in sensation over the left cheek and angle of the mouth. This was of the nature of a slight hypoæsthesia of the forepart of the left cheek, most notably present at the margin of the left upper lip just beyond the angle of the mouth.

TREATMENT.

Little can be said of the preventive treatment of facial hemiatrophy while its origin remains unknown; nor can the condition be arrested by any known means. When the condition is well developed, the patient may desire some reconstruction of his features. One or more plastic operations of the type described in this article appear to us to be the most suitable means of improving the deformity. It is perhaps the only satisfactory method where the atrophy is marked and extends to skin and subcutaneous tissue, as in Case I of this series.

SUMMARY.

1. Three cases of facial hemiatrophy are described, one of which was congenital. In no case did the sympathetic nervous system seem to be involved. In one a slight involvement of the trigeminal nerve occurred as a late sign.

2. A method of operative treatment by a tubed pedicle graft is described.

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SOME OBSCURE CAUSES OF CHRONIC ABDOMINAL PAIN.

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A large proportion of patients attending surgical clinics complain of chronic abdominal pain, and many of these cases present great difficulty in diagnosis. The patients may be young adults complaining of pain in the right iliac fossa, middle-aged persons complaining of epigastric pain, sometimes suggesting chronic disease of the gall-gladder; or others may complain of vague abdominal pain and discomfort.

About half of these cases, after a careful history has been taken and after a complete clinical and X ray examination and laboratory tests have been carried out, can be correctly diagnosed; but in the remaining half this often seems impossible, so that the cause of the pain remains unsolved.

This paper is directed to a consideration of the latter cases, and as an example the complaint of chronic pain in the right iliac fossa will be discussed. Many of these patients have been subjected to laparotomy, making possible an examination of the appendix, which, though found to be normal, has in the circumstances not infrequently been removed. The removal, if carried out, however, has not relieved the symptoms. I have seen persons in whom several operations—appendicectomy, cholecystectomy, right ovariectomy, correction of uterine displacements and operations for adhesions—have been performed, but the chronic pain has persisted.

Many reviewers[1][2][3] have drawn attention to the unsatisfactory results of the removal of the so-called chronically inflamed appendix, and of cholecystectomy for the "stoneless gall-bladder". They agree that at least 30% of patients were unrelieved of their symptoms. Chalfant[1] states that: "It is a notorious fact that the ultimate result of the operation for 'chronic appendicitis', so far as relief from symptoms is concerned, is among the poorest in surgery, owing almost entirely to faulty diagnosis."

Connell[2] pointed out that: "After eliminating all demonstrable pathological conditions that might possibly be confused with 'chronic appendicitis', there remains in certain cases some cause for pain in the right iliac fossa, the exact nature of which is as yet not definitely known."

Such patients are usually labelled as neurotic, hysterical, or even as malingerers; but it is difficult to believe that a patient who will submit to so many operations can be relegated to any of these classes.

This type of patient is evidently suffering from some definite pathological lesion, and all we can deduce from such a series of operations is that the symptom is not due to any abnormality of the organs which have been removed. What is required is a more exhaustive history and a more detailed clinical examination, a minute study of the nature and degree of the pain, its situation, the times at which it appears and disappears, and the factors which relieve or aggravate it.

In the cases under discussion, the only positive clinical sign usually elicited is tenderness on deep pressure in the right iliac fossa. We have been taught to associate tenderness of the abdominal wall with disease of the underlying viscera. Attempts to explain this association are made in the McKenzie-Head theory of the viscero-cutaneous reflex, and by Morley's[4] theory of peritoneo-cutaneous radiation. While these theories may explain the mechanics of pain in the areas related to visceral disturbances, they are insufficient to enable us to deduce all the sources of tenderness of the abdominal wall.

The method of examination described by Carnett[5][6] I have found helpful in this direction. In endeavouring to ascertain the nature of an abdominal swelling we first determine, by tightening the abdominal wall, whether the swelling is within or without the abdominal cavity. This same tightening of the abdominal wall may be used to investigate causes of abdominal tenderness. In these circumstances, instead of causing the patient to raise the head and flex the knees so that the abdominal wall is relaxed, we reverse the procedure, and ask the patient to contract his abdominal muscles strongly—to raise his head and heels slightly from the bed. The points of the fingers of the examiner, rather than the flat hand, search for tender areas. By this test we can divide our patients into two groups: first those in whom the tenderness disappears, and second those in whom the tenderness does not disappear. In this way the intraabdominal or extraabdominal source of the pain may be ascertained.

Group I.—In cases in the first group, when palpating the abdomen, the muscular wall of which has voluntarily been made rigid, we are unable to disturb the viscera or the parietal peritoneum. The disappearance of tenderness resulting from this rigidity is a reliable indication that the trouble is within the abdominal cavity. Confirmation of this conclusion may be obtained by the examination of patients suffering from acute abdominal conditions; for example, the exquisite tenderness in the right iliac fossa in acute appendicitis can be banished or greatly diminished if this test is properly carried out, always provided that none of certain pitfalls are present, such as the actual involvement of the anterior abdominal wall. Even in early cases of perforated gastric ulcer the test holds good; in fact, I have seen such cases in which the reflex rigidity of the muscle was associated with the absence of tenderness.

Group II.—In the second group the tenderness does not disappear, in spite of the voluntary tension of the muscles of the anterior abdominal wall. In these circumstances the source of the pain may be regarded

as parietal and not visceral, and this is especially the case if the tension actually increases the tenderness. The tender areas found in carrying out this test are commonly situated where the abdominal nerves pierce the fascia; for example, at the lateral border of the rectus muscle. Frequently hyperæsthesia and tenderness along the course of the nerves are also present. Hyperæsthesia may be demonstrated by picking up a liberal fold of skin and subcutaneous tissue between the finger and thumb and pinching it lightly. This method of testing has the advantage that it is not dependent on the answer of the patient. We observe the obvious wincing when a hyperæsthetic area is being pinched. The hyperæsthesia can usually be demonstrated to be limited to an area supplied by an intercostal nerve; for example, the twelfth dorsal. It is unlikely that patients will know the exact distribution of the root zones, so that we can often demonstrate that the hyperæsthesia follows the zone right to the mid-line dorsally, and even downwards to that area of skin over the buttock supplied by the twelfth dorsal nerve.

We may digress here for a moment. The exact significance of hyperæsthesia in the diagnosis of acute abdominal conditions is the subject of much diversity of opinion. Moreover, the exact site in the skin indicating such visceral lesions is unsettled. Morley believes that hyperæsthesia gives no help in the diagnosis of acute abdominal conditions, and is only of academic interest; with this opinion I concur. On the other hand, hyperæsthesia is very strikingly present in cases of chronic abdominal pain with tenderness which persists on palpation when the abdominal muscles are strongly contracted, and these patients are often shown by subsequent laparotomy to have no diseased abdominal viscera. In these cases, therefore, the hyperæsthesia indicates an irritable intercostal nerve and is not referred reflexly from the viscera. When any one or more of the lower dorsal and first lumbar nerves are involved the resulting pain and tenderness in the abdominal wall may closely resemble the symptoms of various intraabdominal lesions, such as chronic cholecystitis, gastric ulcer, perforated duodenal ulcer, appendicitis *et cetera*.

The absence of other neurological signs may enable us to say that there is no lesion of the spinal cord or roots, and that probably the site of irritation is situated at the intervertebral foramina. This we see occasionally in sciatica, in neuralgia of the head and neck, and in the thorax as pleurodynia and pseudoangina. It has been found that intercostal neuralgia, acute or chronic, remittent or relapsing, is in most cases associated with excessive lumbar lordosis, or scoliosis (often due to a short leg) or spinal osteoarthritis. There are usually other factors in association with these conditions which determine the onset of the attacks, such as toxæmia or occupational difficulties. Many of these cases occur in young women who work power machines. In such work stereotyped action, such as depressing a pedal, is often carried out all day. Further, the wearing of high heels, tending to produce lordosis, sleeping on soft sagging beds, fatiguing occupations, such as those of salesman, hairdresser or ballet dancer, in which continuous

standing is necessary, or excessive physical culture, may all contribute to the onset of such neuralgias.

In these cases symptoms due to causes other than intercostal neuralgia may also be present and complicate the picture. These arise from mechanical interference with visceral functions, due to acquired (not congenital) visceroptosis, the result of exaggerated lumbar lordosis and dorsal kyphosis, or from excessive ligamentous strain.[7]

It may be asked why the pain is most commonly on the right side, and of this I must confess my ignorance. If, however, one asks specifically about the left side, the patient will frequently complain of pain there as well, though it is not usually so severe as on the right.

Hyperæsthesia is often demonstrable on the left side as well as on the right. In some cases the pain is entirely left-sided. It may be that, since the patients know that the appendix is right-sided, they tend to report the symptoms on that side only.

When scoliosis is present the pain is usually on the same side as the concavity. In the thorax, pleurodynia and pseudoangina are most commonly on the left side, and the concavity of the scoliosis usually faces the left. In these circumstances also the patient knows that the heart is situated on the left side, and will attach more importance to left-sided symptoms.

There is one group of cases in which we find tenderness on deep palpation in the right iliac fossa at about McBurney's point, and also at the left corresponding point. With the tensed muscle test the tenderness vanishes. These patients also suffer from discomfort at night, causing sleeplessness. They are suffering from bilateral chronic strain of the anterior sacro-iliac ligaments, and have marked lordosis. They have what the French describe as the *attitude ligamentaire*. This defective stance is characterized by the following points: first, the legs, instead of being nearly perpendicular, are sloped forwards; second, the trunk is inclined backward, so that the scapulæ overhang the buttocks and the lower part of the abdomen projects forward. The body weight is thus allowed to pull on the ligaments.

In these cases the anterior aspects of the sacro-iliac joints are easily palpated through the abdominal wall, when tenderness is elicited.

With intercostal neuralgia in older patients, in whom the gall-bladder has been removed without relief of symptoms, one often finds hypertrophic osteoarthritis of the spine, or, alternatively, a high lumbar lordosis. It is possible for patients suffering from intercostal neuralgia to develop appendicitis, an ovarian cyst, or some other lesion, but operations to cure these conditions will not of themselves cure the neuralgia.

TEST FOR EXAGGERATED LORDOSIS.

When searching for postural errors, the patient's stance as a whole should be observed. To estimate the amount of fixed lordosis, the following test is useful.

Stand the patient with the back to a wall, heels 10 centimetres (four inches) from the wall, and ask him to flatten the whole spine

against the wall. There should be a space of no more than 2·5 centimetres (one inch) between the mid-lumbar region and the wall. Many of the patients cannot bring this part nearer to the wall than a hand's breadth.

TABLE I.

Showing Location of Pain.

Site.	Number of Cases.
Right iliac fossa	51
Left iliac fossa	4
Epigastrium	6
Total	61

TABLE II.

Showing Relationship between Previous Operation and the Giving of Exercises.

Group.	Supervised Exercises.	No Exercises.
Previous operation for the pain (30 cases)	6	24
No operation (31 cases)	19	12
Total (61 cases)	25	36

TABLE III.

Showing Results of Treatment after Exercises and after No Exercises.

Group.	No Symptoms.	Improved.	Not Improved.	Result Not Known.
Supervised exercises—				
(*a*) After previous operation (6 cases)	—	3	1	2
(*b*) No operation (19 cases)	12	5	—	2
Total supervised exercises (25 cases) ..	12	8	1	4
No exercises (36 cases)	3	1	12	20

TREATMENT.

The treatment consists essentially in correcting the spinal errors by proper postural exercises, but not by general Swedish exercises. These latter contain a large proportion of useless movements, some of which tend to produce lordosis. Relief follows when the exercises are correctly and enthusiastically carried out, and many of my patients

have now become completely free from symptoms. The majority of the patients are greatly improved; that is to say, the attacks are fewer and less severe.

If a short leg be present, the raising of one shoe may relieve the symptoms.

Other factors are important in treatment. Adequate rest should be secured. The nature of the employment must be changed if necessary, or, failing this, the conditions of employment must be adjusted to suit the individual patient. The chair, for example, used by the patient must be of proper height. The pedals of any machine must be used alternately with each foot, and should be conveniently placed. The wearing of high heels should be prohibited, and also the sleeping on soft sagging beds. Septic foci should be removed, and chronic constipation treated. The patient should have an adequate diet, with a sufficiency of vitamins. In extreme cases the injection of a local anæsthetic into the nerve may give temporary relief. The provision of adequate rest would seem to be the reason why some of these patients are relieved temporarily by appendicectomy, only to experience a return of the pain on resuming their ordinary life.

RESULTS OF AUTHOR'S SERIES OF CASES.

The result of treatment in 61 cases of chronic abdominal pain diagnosed neuralgia as described above are set out in the accompanying tables.

CONCLUSIONS.

1. Carnett's tensed muscle test is a valuable aid in diagnosis, differentiating intraabdominal from the extraabdominal origins of pain.

2. It is important to examine the spine thoroughly in all cases of chronic abdominal pain.

ACKNOWLEDGEMENTS.

I wish to acknowledge the cooperation of Miss M. Burke, Miss N. Ashworth and Miss N. Reith, of the Alfred Hospital Massage Staff, who gave the postural treatments.

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The Australian and New Zealand Journal of Surgery.

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RADIUM THERAPY.

IT is still difficult to define the legitimate part of radiotherapy in any plan of treatment for cancer. An important condition for success with this new method is the existence of a degree of sensitiveness to radiation greater in the newgrowth than in the surrounding healthy tissues. Now, while we know that tumours of a particular histological type, such as lymphosarcoma, are highly radio-sensitive, and others, like melanoma, are almost constantly radio-resistant, we are still far from the position of being able to set up a new hierarchy of malignant growths based solely on their manner of response to radiation. At the same time, it must be remembered that radio-sensitiveness is by no means synonymous with radio-curability. The highly cellular anaplastic growths which respond almost magically to small doses of radiation, are precisely those which have already generalized early and irreparably.

Radiation therapy acts purely as a local agent. There is no evidence that it possesses any immunizing power. Even the claim that it

stimulates the so-called "defence mechanism" by inciting the connective tissue stroma to greater resistance against invading cancer cells does not appear to be founded on any clear proof.

Its scope as a definitely curative measure remains for the present extremely limited. The successes gained have been chiefly against basal celled and squamous carcinomata in positions where the tumour was accessible. Its field of usefulness must therefore to some extent overlap that of surgery, and it must frequently find its chief recommendation in the avoidance of mutilation and deformity. The adoption of this new therapy has not therefore appreciably influenced the mortality rate from cancer as a whole.

But if this were offered as a complete statement of the position it would be both unjust and untrue. If radiation therapy had never invaded the jealously guarded domain of surgery, we should still have to concede its great value in the relief of symptoms and the prolongation of life for the incurable cancer patient. Nor should we belittle this even if it be as we believe—the outstanding merit and achievement of radiation therapy. It is only necessary to mention the palliation provided for patients with carcinoma of the *cervix uteri*, a majority of whom at the very moment of consultation are in so advanced a state of the disease as to be beyond the reach of any surgical treatment.

The surgeon in his evaluation of this new form of treatment must keep an open mind. He must neither refuse to interest himself in a science still in the embryo stage of its development, nor permit himself to be swept away with the excessive fervour of the new convert. There should be no confusion between promise and performance. Further, whoever enters this new field of work without proper training and experience is foredoomed to failure. The surgeon who lightly and irresponsibly undertakes radium therapy is as great a danger as the physicist who, confined in his laboratory, believes that the cure for cancer can be expressed in terms of energy units delivered to the tumour.

The present call is for clear and unbiased judgement in the appraisal of results and for frank consultation between different specialists in order to determine the optimum treatment in a particular case.

H. M. MORAN.

Surgery in Other Countries.

[In this column will be published short résumés of articles likely to be of practical value from Journals published in other countries and not readily accessible to surgeons in Australia and New Zealand.]

A New Anæsthetic for Intravenous Use.

Marinestabsarzt Dr. Heim (Martin Luther-Krankenhaus, Berlin): *"Eine neue intravenose Narkose"*, *Der Chirurg*, November 1, 1934, page 742.

The author states that the search for an anæsthetic agent which will thoroughly satisfy the demands of both surgeon and patient continues. Dr. Heim presents yet another drug for intravenous use in the form of "Eunarcon". This is the sodium salt of isopropyl-b-bromallyl-N-methyl-malonylureid, in 10% solution. It belongs to the class of nitrogen substituted barbiturates, and is a stable solution put up ready for use in five and ten cubic centimetre ampoules by the firm of Riedel de Häen. The dosage and method of administration are similar to those of "Evipan", but the relaxation is said to be more complete and the duration longer. The author has used it in 151 major operations, in 47 of which no other supplementary anæsthetic was used. Most of these were not formidable operations, though a few were. The anæsthetic could rarely be expected to last more than an hour, the times varying from twenty-five minutes to two hours.

In his earlier cases Heim had a few disquieting symptoms after the use of preliminary morphine and hyoscine, but since discontinuing these he has had no trouble.

Small doses of two to four cubic centimetres for minor procedures have been given with great success. It is said that the patients wake up fresh after from two to twelve minutes of anæsthesia, having complete amnesia for the procedure.

Further use must prove whether this is to be a real advance, or only another experimental step towards the evolution of the ideal anæsthetic.

Arthur E. Brown.

Surgical Treatment of Profuse Bleeding from the Stomach.

Professor Hans Finsterer (Vienna): *"Traitement chirurgical de l'hémorrhagie profuse aigue de l'estomac"*, *Journal de Chirurgie*, Volume xlii, November, 1933, page 673.

Finsterer points out that surgical treatment of bleeding gastric ulcer has always been regarded as unsatisfactory because the surgeon is called in only when a patient is dying and when medical treatment has failed. Mortality figures, he holds, can be properly compared only when the physician treats all his patients to the end without sending for the surgeon when the patient is *in extremis*, and when the surgeon is allowed to treat his patients without precious time being wasted on medical treatment.

Unfortunately there are no statistics in the literature of immediate operation except his own. He has taken only those cases of acute profuse hæmorrhage which start either with a big hæmatemesis or with melæna and syncope. He has excluded all chronic bleeding in which treatment is not urgent. In 46 cases in which immediate operation was performed, he has had only two deaths (4·3%). This is a lower mortality rate than is quoted for medical treat-

ment. In the last ten years Finsterer has refused to operate in only two cases of hæmorrhage from chronic gastric ulcer. One patient had a tuberculous caecum and the other considerable wound sepsis from a recent opèration. No ulcer is too big to contraindicate operation. For example, a case of Grünfeld (amongst others) is quoted in which the patient lived for ten days with an erosion the size of a broad bean in his aorta. In reply to those who say that in several cases the cause of the hæmorrhage could not be discovered at autopsy, Finsterer quotes Bulmer's figures (24 in 526) in support of his own experience that these are rare. When the diagnosis is not certain, exploratory laparotomy should be preferred to medical treatment, because laparotomy under local anæsthesia is not dangerous, and precious time is not wasted. When the cause cannot be discovered at operation, one can be sure that the hæmorrhage will cease with subsequent medical treatment. Of the only 7 cases in which treatment was started with an exploratory laparotomy, an ulcer was found at operation in three, in two a definite cirrhosis existed, and in the remaining two the cause could not be found.

Finsterer seldom finds the diagnosis of ulcer difficult. A clinical examination will almost always reveal whether the bleeding is caused by cirrhosis of the liver; in most cases an ulcer, when present, has already previously been proved. In three of his cases carcinoma of the stomach was the cause of a profuse hæmatemesis.

Finsterer does not advocate operation in young women who have had no previous gastric symptoms. In the last fifteen years he has seen over 20 cases of severe hæmorrhage in which he advised against operation. None of these patients died.

An objection frequently raised is that the bleeding ulcer cannot be found or that the hæmorrhage from it cannot be stopped surgically. Finsterer points out that an experienced surgeon is required for this operation. He himself has had only three cases in which examination of the piece of resected mucosa failed to reveal an ulcer, and in all these the patients were cured by the operation. Operation, moreover, prevents perforation, which, he holds, is not rare in bleeding ulcer. He has had four cases of simultaneous acute hæmorrhage and perforation (three of the patients died).

The type of operation depends upon the condition of the patient. Resection of the ulcer alone, with ligature of the bleeding vessel at the base, is the best way of saving a life threatened by hæmorrhage. This is always possible in gastric ulcer. When an ulcer in the duodenum is irremovable the simplest method of stopping the hæmorrhage consists in the closure of the pylorus, the performance of gastro-enterostomy and the production of hæmostasis by compression on the duodenum with a pad. Operating in late cases, Finsterer performs a partial gastrectomy, as for non-bleeding ulcer. When the hæmorrhage has been acute and the operation is not performed upon a subject whose strength has been sapped by hæmorrhage over a long period, it is surprising what the patient will stand. Finsterer's results of immediate resection (within forty-eight hours) are excellent—39 cases with one death (2·5% mortality).

In delayed operation, when medical treatment has been carried out for several days, the results are not so good, but better than results from medical treatment alone. In 46 resections, 14 patients have died, giving a mortality of 30·4%. In six cases death could not be attributed to hæmorrhage. The causes of death in these were: (i) dysentery, (ii) diabetic coma, (iii) uræmia, (iv) gangrenous appendicitis, (v) and (vi) peritonitis from perforation of the ulcer (in both cases death was from perforation and not from hæmorrhage). Subtracting these six cases gives a mortality rate of 17·4%, the deaths being due to peritonitis, cardiac failure, bilateral pneumonia, and five from exhaustion following on the sustained hæmorrhage (from big vessels in every case). The success of the operation thus depends upon a sure hæmostasis and on the length of time for which the bleeding has been allowed to continue. The operation must be done as soon as possible.

To obtain good results, ether must be avoided. A weak (0·25%) solution of "Novocain" is adequate in an already debilitated patient, and stronger solutions

are toxic. Above all, care must be used in giving morphine, for ordinary doses (0·015 gramme or a quarter of a grain) can cause paralysis of the damaged respiratory centre.

The statistics quoted by Finsterer for the treatment of acute severe hæmorrhage may be set out as follows:

TABLE I.

Medical Treatment.

Author.	Cases.	Deaths.	Mortality.
			%
Bulmer	467	47	10·0
Lynch	31	4	12·7
Berner	88	13	14·6
Chairmont	19	5	26·0
Zweig	17	3	17·6

TABLE II.

Surgical Treatment.

Type of Operation.	Cases.	Deaths.	Mortality.
			%
1. *Immediate Operation* (within 48 hours of onset):			
Gastro-enterostomy	7	1	14·2
Gastrectomy	39	1	2·5
Total	46	2	4·3
2. *Delayed Operation* (previous medical treatment):			
Gastro-enterostomy	7	3	
Excision of ulcer	2	1	
Gastrectomy	46	14 (8	30·4 17·4)
Total	55	18 (12	32·7 21·8)

H. FAGGE.

ACUTE PANCREATITIS.

O. Mikkelsen (Copenhagen): *"Pancreatitis acuta; schwere Fälle, besonders hinsichtlich ihrer konservativen Behandlung"*, *Acta chirurgica Scandinavica*, Volume lxxv, 1934, page 373.

MIKKELSEN'S article is of great interest because of the strong and impressive plea he makes for the avoidance of any primary operation in cases of acute pancreatitis. To support his argument he underlines the following points: (1) Operations directed to the pancreas itself show a very high mortality, averaging in the hands of different surgeons 68% in severe and 23% in slight cases. (2) There is no anatomical basis which can justify any direct attack on the pancreas as a reasonable method of curing the disease. (3) Operations

undertaken during the acute stage aiming at the drainage of the bile passages without direct attack on the pancreas, have not sensibly lowered the mortality.

In his own work, treating the patients purely conservatively and without any primary operation at all, of 39 patients whose condition was graded very severe and moderately severe, he lost three, a mortality of 7·4%. The definitely mild cases are not included in these figures.

The major difficulty in avoiding operation is the uncertainty of correct diagnosis, and Mikkelsen gives it as his opinion that by clinical methods alone, if they are carefully carried out, a correct diagnosis should always be made. He enumerates the main symptoms as follows: (i) The general condition of severe shock and intoxication, with a pulse better than would be expected. (ii) Pains, very severe, and radiating to the left loin from the mid-line, or slightly to the left of it in the epigastrium. (iii) Profuse watery vomiting, often bile-stained, but never fæcal. (iv) Temperature low at first, rising during the first and second day. (v) Distension of the upper part of the abdomen, due to paralysis of the transverse colon, later spreading downwards as paralytic ileus develops. (vi) Absence of rigidity. (vii) Tenderness from the mid-line across to the left of the epigastrium. Of the various laboratory aids to diagnosis he discusses the estimation of diastase and lipase in the urine, and of the blood sugar. While the two last, lipase and blood sugar estimations, are in his opinion of secondary importance, he has found estimation of the urinary diastase, by the method of Fabricius Moller, to be a very valuable supplement to clinical methods.

The treatment given to the patients comprises the oral administration of copious fluids, mainly water and tea, but no other food; abundant fluids, up to several litres daily, are given subcutaneously and intravenously. Fifty grammes of glucose in 5% solution, combined with insulin injections, may be given if thought necessary. Cardiac stimulants, especially if the blood pressure is low, and various agents, including forms of pituitary extract, are given for stimulating bowel peristalsis.

By these means the acute attack can generally be tided over, and then a period of two or three weeks should elapse before any possible operative attack on the bile passages is considered. Only about 50% of these patients are found to have gall-stones, and the secondary operation is performed only on those in whom a clear history of gall-bladder trouble precedent to the attack of pancreatitis is given. In Mikkelsen's experience the danger of recurrence of serious pancreatitis is slight, only one such case having been seen by him.

The article is very well written and set out, and presents an argument for his method of treatment far more forcibly than can be conveyed in a short abstract.

ARTHUR E. BROWN.

REDUCTION OF INTUSSUSCEPTION BY MEANS OF CONTRAST ENEMATA AND THE X RAY SCREEN.

P. M. Sjöström: *"Über unblutige Desinvagination von Darminvaginationsfällen mit Hilfe von Kontrasteinlauf unter Röngtendurchleuchtung"*, *Der Chirurg*, October 15, 1934, page 706.

THE author describes a method used at Lund whereby the dangers both of an open operation in young children and of the usual pressure reduction may be reduced to a minimum. The method is used as a pre-operative attempt, and the author stresses the fact that in the event of failure, operation is an urgent necessity. The contrast fluid is run in with the child on the X ray table and at a pressure of from 0·5 to 1·0 metre. Reduction is watched on the screen, and may be facilitated by manipulation of the visible bowel. In successful cases the children are retained in the wards for a few days, and if there is then any doubt they are reexamined by opaque enema.

The true ileo-caecal intussusceptions have in the author's experience been the favourable cases. Ileo-ileocolic cases give a high percentage of failures and,

if recognized, should be looked on as a contraindication to the use of the method. In this type the obstructive symptoms occur much earlier than in ileo-caecal cases, and on X ray examination the characteristic appearance is that the fluid will often run between the intussusceptum and the sheath. The method fails most often in very young infants, in the treatment of whom the desirability of avoiding operation is greatest. The duration of symptoms is of importance. In the first six hours the author has had 100% of successes, in the first twenty-four hours 74% and in the first forty-eight hours 62%.

If the indications are unfavourable an attempt should be made with this method, as a partial reduction will at least make subsequent operation simpler, but the operator should not prolong or persist in the attempt. The author emphasizes that the child should not be kept on the table for more than an hour, and it must be remembered that the procedure has more than a trifling effect on the patient.

While admitting that the delay and the manipulations in the case of failure may be detrimental to the child, he states that he has never had to account them as factors in a fatal case after operation; on the other hand, success in the method eliminates the operative mortality. The advantage of working under direct vision makes this method preferable to the older methods of pressure reduction.

Finally the author points out that the classical signs of blood and mucus in the stool, a palpable tumour *et cetera*, are late signs; and he recommends that a child with recurrent abdominal pains should be examined by X rays early in order to establish the possible diagnosis of intussusception.

ARTHUR E. BROWN.

Reviews.

RECTAL AND COLONIC DISEASES.

Diseases of the Rectum and Colon. By J. P. LOCKHART MUMMERY, F.R.C.S., M.A., M.B., B.C.; Second Edition; 1934. London: Baillière, Tindall & Cox. Royal 8vo., pp. 624, with 247 illustrations. Price 35s. (England).

THIS book needs no introduction to our readers, it is a classic, but the appearance of a new edition must interest all its old adherents and gain the allegiance of a younger generation.

The first half is devoted to diseases of the anus and rectum, and contains all the recent advances in knowledge of these regions. For the permanent cure of hæmorrhoids, while advocating injection treatment, the author prefers the ligation operation. The chapter on fistula is excellent. The author strongly advises the two-stage operation for complicated cases, and explodes the statement that division of the internal sphincter produces incontinence.

With regard to pruritus, the author believes in Ball's operation, and deprecates the use of X rays.

An interesting chapter has been added on pre-cancerous conditions in which the author gives his well-known views on Mendelian inheritance.

Carcinoma of the rectum is well described, and the opinions of the author on contraindications are very valuable. Naturally he prefers his own operation, and its technique is well illustrated by actual photographs. With regard to radium, he describes some good results in inoperable cases, but states that owing to the uncertainty of its action, radium should not be used in operable cases.

In the treatment of megacolon, while giving Royle and Wade credit for discovering the treatment, he prefers Gask's technique of stripping the pre-aortic

plexus. He is a strong advocate of appendicectomy for ulcerative colitis, and recommends colostomy as the safest treatment for acute diverticulitis.

The remaining chapters on carcinoma of the colon and operative technique are very sound.

The introduction of touched-up photographs to illustrate operations is interesting and, on the whole, successful. This book continues to be the best textbook on the subject in English, and should be on every surgeon's bookshelf.

PRACTICAL ANATOMY.

A Manual of Practical Anatomy. By PROFESSOR THOMAS WALMSLEY, Belfast; Part I, The Upper and Lower Limbs, Second Edition; 1934. London: Longmans, Green & Company. Pp. 369, with 117 illustrations. Price 12s. 6d. net.

IN his "Manual of Practical Anatomy" Professor Thomas Walmsley has made a conscientious attempt to provide a "Directory of Dissection", not intended to replace a systematic textbook of anatomy, that will form a reliable guide of procedures to be adopted in the dissection room. It is clearly written, very complete, has no unnecessary detail, and should meet with well deserved success.

Part I deals with the upper and lower limbs. It contains, in the first fifty-five pages, a very useful introduction to anatomy, which, if carefully studied, will form a firm ground work on which further study can be based. There are many references to applied anatomy, descriptions of the regional examination of the living subject, and exercises in the making of measurements, which are used in clinical practice.

The book is well illustrated by diagrams; there are many excellent X ray photographs, accompanied by outline sketches, which serve as a key to their interpretation. In addition, there are many outline sketches of skeletal parts, for completion by the student, who should fill in muscle attachments, epiphyseal lines, and the relative position of the adjacent soft structures. The diagrams of sections through the limbs, at various levels, are accompanied by full written descriptions.

The nomenclature is that recently adopted by the Anatomical Society of Great Britain and Ireland, and departs, in many respects, from the "B.N.A." terminology, although, as far as possible, the English equivalent of the Latin term is used. In all, the book is an excellent production, which can be recommended for students in medicine and massage. The incorporation of applied anatomy is a welcome feature.

RADIUM THERAPY AND CANCER.

Radium and Cancer. By H. S. SOUTTAR, D.M., M.Ch. (Oxon), F.R.C.S. (Eng.); 1934. London: William Heinemann (Medical Books) Limited. Pp. 387, with numerous illustrations.

THIS monograph by Mr. Souttar marks a very real progress in the matter of English publications on the subject of radium and cancer. It must be surely rare for a surgeon to possess so complete a grasp of the physical principles which underlie this new treatment. Further, the author has the very signal advantage in that he brings to the practice of this new art a wealth of experience gained in surgical wards and a sane appreciation of the value and limitation of all methods that are unfortunately but local measures directed against a generalizing disease.

It may appear hypercritical therefore to point out that the chief defect in this work is its lack of balance. In a volume of some 380 pages nearly one-half is devoted to the purely physical side of the subject; the biological aspect, surely of no less importance, is dismissed in a single chapter of ten pages. Radionecrosis is brushed aside with only a passing reference.

No one seriously concerned with the practice of radiotherapy would wish to understate the significance of the physical factors; but it would be highly wrong to encourage the idea that success in treatment is merely a matter of "dose". A twin key to the solution of this vexed problem must lie in radiobiology. It would appear that every cell in the human body has a specific range of sensitiveness to irradiation. The lymphocytes are at one end of the hierarchy, the nerve cells at the other. Most tissues are made up of elements varying in their degree of sensitiveness; the malignant tumours that grow from such tissues can often be made to shrink in volume and to give the fleeting illusion of a cure. It is the tragedy of radiotherapy that it wins so many local actions, but loses the decisive battle.

Again one can righly complain that the author draws no clear line between the domain of definite achievement and those vast areas over which no valid claim for the hegemony of radium can be made. We should face the facts clearly. Is there any justification for allotting so much space to the radium treatment of œsophageal cancer? Can any series of cures by any of the methods mentioned be cited? The author's enthusiasm, however, allows him to grasp at the straw of intrathoracic exposure with insertion of "seeds" in and around the growth. And naïvely he counts for achievement the fact that the patient is "invariably sitting up in bed next day apparently in complete comfort", and that in one instance such a patient died from secondary metastases in the brain "after some months of practically perfect health".

Or, is there any reason for continuing to bolster up the weak case for radium therapy in cancer of the rectum? Why should more consideration in the matter of space be given to this neoplasm than to buccal cancer, where radium can claim some notable successes? At the end of a long discussion on rectal cancer, in which techniques are discussed, we find the admission that the results have been "most disappointing", and that Gabriel, of St. Mark's Hospital, found that the method involved all the danger and inconvenience of a perineal excision without any of its advantages. The author might have added that the method is extremely painful and its use subject to many complications. Most surgeons in Australia have long since abandoned the practice.

We have reached a stage in the use of this physical therapy at which it is impossible to deny certain real gains. The achievement in the main has been against squamous carcinoma when superficially situated. From the confusion of literature and experience certain truths are clearly revealed. One is that no great measure of success awaits the surgeon who is an occasional radium therapist; he must study his subject *au fond*. The second is that the new conceptions implicit in this new method have already had some influence on the practice of surgery. In some instances at least the surgeon has modified his course, perhaps unconsciously. The old mutilating operations on the jaw and mouth have become rare—in some cases too rare. The treatment of the secondary spread of squamous carcinoma to lymph glands, although still in a state of flux, is no longer quite the same. The surgeon has been stirred from the complacency with which he regarded his own failures in the treatment of cancer as inevitable, while at the same time being highly critical of the merely partial successes of radiation therapy. He realizes that while the new physical therapy has no logical right to claim for itself the dominant place in the treatment of a disease whose causes elude us, nevertheless the time will come when mere ablation of large tracts of tissue will be regarded with the same sense of failure as in amputation. For surgery there are nobler laurels to be won from reconstruction and repair and with a knowledge of function no less deep than that of structure. The surgeon is no longer the dramatic figure of former times producing his theatrical result with technical legerdemain, but rather a patient and contemplative director who from the wings contrives the slow and successful denouement.

The new horizons which lie before radium therapy can be lighted only by the close and sympathetic collaboration between the surgeon, with his clear appreciation of anatomical spread, and the radium therapist, thinking in terms of the biological response to carefully controlled units of energy. The author of the book before us has to a degree embodied the characteristics of these different

collaborators. In his difficult task he has shown himself free on the one hand from the unbridled enthusiasm of those who are too ready to proclaim the new dawn, and, on the other, unshackled by the prejudices of surgeons whose spiritual predecessors opposed with similar virulence the "speculative theories" of Lister.

A SYSTEM OF SURGERY.

Practice of Surgery. Edited by DEAN LEWIS, M.D., and Associate Editors. In 12 Volumes and General Index. Crown 4to. 1935. U.S.A.: W. F. Prior Company, Inc., Hagerstown, Maryland. Australia and New Zealand: Butterworth & Co. (Aust.) Ltd., Sydney, Melbourne, Wellington and Auckland.

"PRACTICE OF SURGERY", by Dean Lewis, aided by an editorial committee, consists of twelve volumes *et cetera*, and is the most ambitious system of surgery it has been our lot to meet. Consisting as it does of twelve volumes, each averaging over 1,000 pages, it covers the whole range of surgery in a manner that has never been equalled, at least in our language. It is to a large extent the work of surgeons of the Johns Hopkins Medical School, but there are also many contributions from famous American surgeons of other centres. The editors are to be congratulated on the manner in which overlapping—often one of the disadvantages of such systems—has been largely avoided, on the way in which the subject matter has been kept abreast of the latest advances, and on the beautiful manner in which it has been printed, illustrated and bound. While it is possible to criticize some contributions, while there are a few omissions, and while there is at times a little imbalance, the average contributions reach a very high level, and the work as a whole is evidence of the remarkably high standard of American surgery. Many of the sections are written by acknowledged masters in their special surgical fields, and some indeed constitute veritable textbooks in themselves. Pleasing features are the emphasis laid on applied pathology, the acknowledgement made to workers in other countries, and the excellent bibliographical references at the end of many sections. The volumes are bound in strong loose-leaf binders and as progress renders any part of the work obsolete the publishers supply new pages to replace obsolescent material. The work is also regularly enriched in this manner by the adding of new and significant developments in the field of surgery. We are informed that no less than 700 pages were supplied to subscribers during the year 1934. It is also hoped that the monthly abstracts from surgical literature which are to be provided for a small annual subscription, will maintain the high standard achieved by the original volumes.

Volume I.—Case Histories, Diagnostic Methods, Anæsthesia, Armamentarium, Aseptic Technique, Wounds—Infections, Hæmorrhage—Shock, Pre-Operative and Post-Operative Care, Diet in Surgery Diabetes.

Volume I deals with general surgical principles, technique and management, and is in the main excellent. There is a good contribution on various methods of anæsthesia, including all the modern methods which have been brought to such a high pitch of perfection in America, the whole subject being much more fully dealt with than in any other similar system. The chapter on spinal anæsthesia, however, would be more valuable had it included a consideration of other drugs besides "Spinocain". The chapters on theatre equipment and general aseptic principles are full, while those on hæmorrhage and shock are excellent. The modern conception of the ætiological factors and the nature of shock are fully discussed, though insufficient emphasis is laid on the importance of the vicious cycle in secondary shock. It is refreshing to note that the author of this section is as sceptical as we are regarding the value of the head down position in the management of this state. The section on surgical infections is the outstanding portion of the volume, the subject being arranged in an original manner and being very fully and ably discussed. There is, in addition, an excellent bibliography. The chapters on pre-operative and post-operative methods

are concise, and due emphasis is rightly laid on their great importance in surgery. The chapter on diet in surgical conditions is a very useful contribution to an important aspect of management which does not often receive sufficient attention.

Volume II.—Bones, Joints.

Volume II contains a concise but excellent account of the disease of bones, which should go a long way towards clarifying the controversial classification of bone diseases. The various local and general diseases of bone are dealt with in a clear and lucid manner. In the account of bone tumours the author has attempted to subdivide further the classification adopted by the "Registry of Bone Sarcoma". In all, he has given an excellent account of the pathology and treatment of these tumours. The volume includes a consideration of osteomyelitis by Starr, of Toronto, in which the anatomy and blood supply of bone, the types of infection, pathology and treatment are dealt with in a classical manner.

An interesting section has been written on the X ray appearances of developing joints and epiphyses by Cohn. He points out that the time of appearance and number of centres of ossification of epiphyses, as seen by the radiographer, do not conform in many instances with the usual description of anatomists.

It is interesting to read a modern chapter on fractures, based upon wide practical experience, that does not show any sign of the "Böhler" influence. Some aspects of the treatment advocated are so original and unorthodox as not to be acceptable. Surely plating of compound fractures is to be deprecated, rather than encouraged.

There is a well balanced account by Campbell on injuries and surgical diseases of joints, replete in every detail. It includes a helpful chapter on arthroplasty, the type of operation recommended, the results to be expected in various joints, and after-treatment.

Volume III.—Bones and Joints (Continued), Muscles, Tendons, Nerves, Brachial Palsy, Sympathetic Nerves, Lymphatics, Amputation.

Volume III is also well written, and is liberally illustrated with photographs, diagrams and X ray pictures. It includes a detailed description of tuberculosis of bones and joints, and a clear and concise account of rickets. The chapter dealing with dislocations is complete in every detail and contains an account of acute, recurrent and unreduced dislocations of every joint, together with their appropriate treatment.

Anyone who has had difficulty in the treatment of such conditions as scoliosis, sacro-iliac strain and tuberculosis of the spine will receive much useful information in the section on orthopædics, dealing with these subjects.

An excellent chapter has been written by Bunnell on tendons, ganglia, muscles and fascia. The section dealing with reconstructive surgery of tendons is particularly good, and contains many original and instructive methods which have not been dealt with by previous authors.

Great advances have recently been made in the surgery of the peripheral nervous system, which are all incorporated in three chapters dealing with the subject. Dean Lewis's section on peripheral nerve lesions and their treatment is most stimulating and instructive. Of particular interest, too, is the section dealing with the surgery of the autonomic nervous system, and although it is admitted that much has yet to be learned on this subject, the present-day state of our knowledge is clearly outlined.

The description of diseases of lymphatics contains many new conceptions. It is original, but we find it hard to agree with some of the rather dogmatic statements.

Amputations, scantily dealt with in most textbooks of surgery, receive due recognition, and are dealt with from the point of view of the prosthesis maker as well as the surgeon. This chapter dealing with amputations and hints on artificial limbs, usually ignored, is one of the most valuable sections of this volume.

Volume IV.—Eye—Ear—Nose, Mouth—Jaw, Salivary Glands, Pharynx—Larynx—Trachea, Thorax—Œsophagus, Mediastinum, Heart—Pericardium.

In Volume IV the surgery of the eye is first dealt with. This chapter is concise and contains most of the modern developments in this field. It would have been more valuable had it been accompanied by a bibliography. In comparison with many other sections, that dealing with the surgery of the ear is a little disappointing, but that on the surgery of the nose and sinuses is excellent. It contains a good discussion on retrobulbar neuritis and so fills a great need. The surgery of the mouth, jaw and face is also very well done by Bloodgood, being beautifully illustrated, while the surgical pathology of the various lesions is full and more accurate than in many American textbooks. In many ways this contribution is one of the best expositions of the subject we have read. The portion dealing with the surgery of the pharynx and œsophagus is not very full and we should have liked to have seen fuller acknowledgement given to British workers in this field. The outstanding contribution in this volume is from the Chevalier Jacksons, father and son, on the surgery of the larynx and bronchi. As is to be expected from such famous workers, this section, profusely illustrated and documented as it is, is among the best in the whole book, being a complete textbook in itself. It should be of inestimable value to all those who are interested in this section of surgery.

There are, in addition, excellent chapters on such subjects as the surgical physiology of the lungs by Graham, the management of empyemata, and a unique discussion on the diagnosis and management of mediastinitis. The final chapter deals with the surgery of the heart, and is written by Cutler, the best known worker in this field.

Volume V.—Pulmonary Tuberculosis, Pulmonary Suppuration, Massive Collapse of Lung, Tumours of Chest, Mammary Glands, Diaphragm, Plastic Surgery, Hand.

Volume V is devoted to surgery of the chest, breast and cleft palate, as well as to plastic surgery and surgery of the hand. Professor E. W. Archibald is responsible for the chapter on the surgery of pulmonary tuberculosis, and we regret that he has only been allowed forty-six pages. Brief as it is, his article is delightfully written and illustrated by excellent reproductions of skiagrams. Hedblom contributes three interesting chapters on pulmonary abscess, bronchiectasis and diaphragmatic hernia, with extensive bibliographies. Diseases of the breast are dealt with by Bunts in a very satisfactory manner and the illustrations (some in colour) are very good. Davis and Traut give a very complete account of modern aspects of plastic surgery, and the remaining chapters on thoracic tumours, cleft palate and diseases and injuries of the hand are of a uniform standard of excellence.

Volume VI.—Thyroid Gland, Parathyroid, Stomach, Duodenum, Gastro-Enteroptosis, Spleen.

Volume VI deals mainly with thyreoid, stomach and spleen. The article on the thyreoid is most arresting, and takes up about a quarter of the volume (292 pages). It is written by Rienhoff, who deals with the subject most exhaustively, breaking new ground in his account of his studies on the artificial remission in hyperthyreoidism as the result of the administration of iodine. Reflection on these observations will well repay the surgeon who is interested in thyreoid surgery and enable him to understand better the rationale and the vagaries of pre-operative iodine treatment in hyperthyreoidism. The section on stomach begins with a most useful chapter, written by Shelton Horsley, on the physiology of the stomach. Finney writes on gastric ulcer, Hughston on gastric hæmorrhage, Shelton Horsley on duodenal ulcer, Vincent Houhrahan on the spleen—all names famous in the world of surgery. Operative technique is given in great detail and is beautifully illustrated. Bloodgood's article on tumours of the stomach is most illuminating and gives a pathological appreciation of the surgery of carcinoma of the stomach of great practical value. Volume VI is a necessity in the library of the surgeon interested in modern thyreoid and gastric surgery; it represents the last word in American surgery on these subjects.

Volume VII.—Pancreas, Liver, Bile Passages, Appendicitis, Intestinal Tract, Rectum and Anus, Intestinal Obstruction, Peritoneum, Hernia.

Volume VII is devoted to surgical disorders of the pancreas, liver and biliary passages, to appendicitis, the intestines, the peritoneum, and to hernia.

The subject matter is presented for the most part in such a condensed form as presupposes a sound working knowledge on the part of the reader, and tends to be a general review of most subjects, rather than the specialized treatise one expects. There are certain exceptions such as the chapter on pancreatitis, which presents an excellent summary of recent experimental work. There is also a delightful chapter on intestinal obstruction and ileus in which the toxæmia of high obstruction is fully discussed.

The subject of megacolon is well put, but no mention is made of the recent work on the influence of the sympathetic nervous system and the excellent results obtained by ramisection. The paragraph on external biliary fistula should be brought to the notice of all inexperienced operators contemplating a surgical attack on the biliary apparatus.

A very full account is given of the normal anatomy of the biliary tract. It would have been wiser to have condensed this and to have devoted more space to the abnormalities of the ducts and blood vessels in the region of surgical intervention.

The account of the symptomatology of chronic cholecystitis needs rewriting, as the description given is the antique one of chronic cholelithiasis, and is not in accord with the excellent pathological description of the changes to which the gall-bladder is subject.

No mention is made of the need for dilatation of the sphincter of Oddi after incision and exploration of the common bile duct. Experience shows that if this procedure is adopted there is very seldom need for the prolonged drainage, the use of T-tubes *et cetera*, which appear to be common in the practice of the writer of this section. Drainage by a tube inserted through a stab incision in the loin does not seem to be practised, nor is the covering over of raw areas by omentum to avoid adhesions of stomach and duodenum to liver.

The article on acquired benign stricture of the common bile duct is excellent, and the reconstructive operations found to give best results are all mentioned. It seems strange that in the discussion on the treatment of acute appendicitis no account is given of the Ochsner-Sherren "delayed treatment", although a bare mention of Ochsner is made later in the volume when the peritoneum is dealt with. The inclusion of details of this method would have been of greater practical importance than the three pages given over to ætiological factors in appendicitis. Also some mention should have been made of the use of gas gangrene anti-serum in the treatment of acute peritonitis.

Echinococcus of the peritoneum needs rewriting, and the frequency of hydatid of the liver in some countries entitles it to some recognition in a work of this character. The chapter on the colon is too sketchy to be of much value.

Apart from the matters mentioned, this volume is well written and finely illustrated; it has excellent bibliographies on the various subjects and is a credit to the publishers.

Volumes VIII and IX.—Urology.

Volumes VIII and IX deal with urology, the subject being covered very completely and with few exceptions kept up to date. A notable defect is the lack of consideration given to intravenous urography. This subject is dealt with in a few lines and does not carry the reader beyond the use of the original "Uroselectan". Media for intravenous injection have improved greatly in the last few years, and the subject deserves more prominence.

The work is compiled by many of the foremost urologists in America, each author being allotted a subject of which he is a master. In most instances he has used his knowledge to indicate which, in his opinion, is the best method of treatment. This is good. On the other hand, some overlapping and repetition are noticed, which might perhaps have been avoided by more efficient subediting. Occasionally, too, contradictions have been allowed to creep in.

There is no chapter on urine, its abnormalities and their significance, and the methods of clinical and pathological investigation of this fluid. While it might be argued that this subject is not surgery, yet in a publication of this magnitude which aims at completeness we feel that this should have been included.

The only other criticism of any consequence is the curiously unequal reproduction of radiograms. Many are superb, but a few are so bad as to be useless. There is no case sufficiently unusual to excuse the reproduction of bad radiograms.

Caulk discusses renal tuberculosis superbly, and concludes with a most useful summary. Other authors might have given the reader the benefit of a summary with advantage. Hinman has been very happily given hydronephrosis, and has had the opportunity to perpetuate his original research in a textbook which will be a standard work for many years. His exposition of the subject is a masterly summing up of some of the most profound thought and beautiful experimental work in genito-urinary surgery for many years. Kretschmer deserves special mention for his chapter on the surgery of the prostate. He clearly and impartially describes suprapubic, perineal and transurethral methods, the reader being left with no inkling of the fact that in all but one out of his last four hundred and ninety-five cases he has carried out resection by the transurethral method.

McKay's chapter on the urethra is excellent, and his strikingly pungent essay on the modern treatment and maltreatment of gonorrhœa should be read by every practitioner. He is obviously a disciple of Pelouze. Sandford deals adequately with genital tuberculosis. He is not very enthusiastic over the results of surgery in these conditions. There are two chapters which are very welcome, one on the surgery of the adrenals, and the other on the female urethra. Both are done excellently, and it is quite time these subjects received the prominence they deserve.

To sum up, these volumes are undoubtedly the most able and comprehensive textbook of urology since Young published his in 1926. The many advances in the last nine years have been, with very few exceptions, capably dealt with, and we can give no greater praise than to say this work maintains the high standard set by Young.

Volumes X and XI.—Gynæcology.

Volumes X and XI are devoted to gynæcology, with one exception, that by Lockyer of London, the various sections being contributed by representative surgeons of America, so that they can be taken to represent current American thought in this field.

Cullen is rather optimistic about the treatment of corporeal uterine cancer, and his views on the treatment of prolapse are not quite in keeping with British teaching. He is a strong advocate of the practical divorce of obstetrics from gynæcology. Malposition of the uterus is dealt with by Curtis, who prefers the Baldy-Webster operation to all others. The subject of cystocele and prolapse are not given as much consideration as we should like, while in discussing the transposition operation the writer omits to insist on the necessity for sterilization.

There are excellent chapters on vesico-vaginal fistula and the associated complications and complete perineal tears and recto-vaginal fistula by Ward and Kelly respectively. Both of these chapters are beautifully illustrated, and the first is provided with an extensive bibliography.

Gonorrhœa in the female is dealt with thoroughly by Norris. His use of the term pan-hysterectomy for total hysterectomy might be misleading, while there is an historical error in referring to John Hunter as Sir John Hunter. Miller discusses puerperal infection at length, and the present position is well summarized, although we disagree with his view that septic abortion should be treated by non-interference. The section on diseases of the Fallopian tubes is excellent and is beautifully illustrated, while that on sterility by Rubin is concise and clear. Cullen deals shortly with uterine hæmorrhage; we should have liked to have seen a mention of hypothyreoidism as one of its causes.

The largest contribution to Volume XI is by Martzloff on diseases of the *cervix uteri*. It is well illustrated, well documented, and contains an excellent

review of recent figures from various sources. Altogether it is ably written and is a very valuable and useful chapter. Then follow chapters on inflammations, endometritis, and adenocarcinoma of the body of the uterus. These chapters are very well illustrated and both differential diagnosis and prognosis are fully considered. Lockyer, of London, contributes three of the finest chapters in these volumes on the subjects of myoma, adenomyoma and sarcoma of the uterus. Each is a masterly description, being richly illustrated in colour and by excellent diagrams. In our opinion, these three chapters would be a valuable addition to any surgeon's library, and they add greatly to the value of the work as a whole.

Hydatidiform mole, chorionepithelioma and tumours of the adnexæ are dealt with concisely by various authors, the pathology of the lesions being thoroughly discussed.

A little more space could have been allocated to ovarian tumours, but the descriptions, though brief, are very informative, and the section is beautifully illustrated. The remainder of the volume is devoted to discussions of right lower quadrant pain, organotherapy, radiation and pre-operative and post-operative care.

Throughout we cannot help being struck by the excellence of the illustrations of the details of the various operative procedures, and, taken together, the two volumes give most useful, practical and concise accounts of modern gynæcology. They would form a valuable addition to the library of any surgeon.

Volume XII.—Brain, Fractures of the Skull, Cranial Nerves, Spinal Column and Cord, Fractures of the Spine, Blood Vascular System, Skin, Syphilis, Electrosurgery.

Volume XII is outstanding in that it contains the very stimulating section on the surgery of the brain by Dandy. The very size (over 600 pages) of this contribution is indicative of the great advances made in this aspect of surgery, and it marks an important landmark in its evolution. Coming as it does from the originator of ventriculography, from one who has always been original and progressive, and who is rightly regarded as one of the leaders in this field in America, one is not surprised to find that it contains much that is new and much that is instructive. It is true that the writer, who writes as a surgeon, and not primarily from the neurological point of view, is at times iconoclastic and at times far from convincing, but provocative as some of his statements may be, he has a huge clinical experience behind him and has achieved here one of the finest contributions to the subject extant. The description of ventriculography, its value and dangers, is a masterly exposition, while the sections on symptomatology and diagnosis are concise and show evidence of detailed clinical observations. He holds, as is well known, unique views as regards epilepsy and hydrocephalus, and though it is easy to criticize some statements, the discussions on both these subjects are most stimulating. There is an excellent chapter on post-traumatic lesions, while such subjects as abscess, vascular lesions and the effect of ablation of parts of the brain are very fully dealt with and are backed by many original observations. As is to be expected, the chapters dealing with operative technique are fascinating and are illustrated with a wealth of beautiful illustrations and diagrams. The writer has evolved a superb surgical technique, as his work on the removal of intraventricular neoplasms in particular shows. While it is true that we should like to know a little more about the final results in some of his cases, and while we cannot always agree with his somewhat dogmatic statements, we cannot help being struck by his originality of method and thought, and by his great contribution to this aspect of surgery. In addition, the value of the contribution is greatly enhanced by very complete bibliographical references at the end of each chapter. This section is one of the most remarkable in the whole work, and it could be read with profit, not only by all those who have a special interest in this branch of surgery, but by all who are interested in the modern advances of our art.

The other sections of this volume are also very good, particularly that on the cranial nerves, under which the subject of trigeminal neuralgia is particularly well done. In addition, there are sections on the surgery of the spine

and spinal cord, an excellent statement of the modern conceptions of the diagnosis and management of peripheral vascular disease and a beautifully illustrated chapter on surgical diseases of the skin.

In these beautifully produced volumes, then, we have concisely arranged what may be regarded as the last word in American surgery. The work reflects great credit on its editors, and we are sure that predominately American as it is, it will for long remain the standard to which compilers of other systems should strive. We believe that any library of a surgeon or institution at all interested in surgery would be incomplete without it.

Obituary.

FRANKLIN H. MARTIN.

WE regret to announce the death of Franklin H. Martin, founder and managing editor of *Surgery, Gynecology and Obstetrics*. A surgeon of repute, an organizer of marked ability, Franklin Martin leaves behind him *Surgery, Gynecology and Obstetrics* as a monument to his efforts and his surgical ideals.

We in Australia mourn the passing of one of the founders of the American College of Surgeons. We have lost the benefit of the influence of a famous American surgeon who was keenly interested in the standard of surgery in Australasia and in the growth and development of the Royal Australasian College of Surgeons. Franklin Martin, on more than one occasion, furnished us with evidence of his keen interest in the work of Australasian surgeons.

Editorial Notices.

EDITORIAL communications should be addressed to the Chairman of the Editorial Committee, 57 Collins Street, Melbourne, or to any member of the Editorial Committee. It is understood that original articles forwarded for publication are offered to THE AUSTRALIAN AND NEW ZEALAND JOURNAL OF SURGERY solely, unless the contrary be stated.

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